U. S. NUCLEAR REGULATORY COMMISSION

REGION III

REPORT NO. 50-331/95011

FACILITY
Duane Arnold Energy Center
License No. DPR-49

LICENSEE
IES Utilities Incorporated
IE Towers, P. O. Box 351
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DATES
October 29 through December 14, 1995

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1/25/96
Date

AREAS INSPECTED

Routine, unannounced inspection of plant operations, maintenance, surveillance, onsite engineering, and plant support. Announced safety inspections of System Based Instrumentation and Controls (93807) and the licensee's response to Generic Letter 89-10, "Safety-Related Motor-Operated Valve (MOV) Testing and Surveillance," (2515/109) and self-assessment in this area. Safety assessment and quality verification activities were routinely evaluated. Follow up inspection was performed for certain previously identified items.

EXECUTIVE SUMMARY

Within the area of **OPERATIONS**, the inspectors identified several concerns with respect to component configuration and operator performance during surveillance testing. The concerns were similar in nature to issues documented in the prior report period.

- As a result of conflicting documentation, operators were unsure of the correct position for a valve on the control building chiller, which, when they closed it, caused a trip of the chiller (Section 1.4).

- Poor pre-test planning resulted in problems during a high pressure coolant injection system surveillance test (Section 1.5).

- An emergency service water valve was found out of position, which was similar to an issue that is being tracked by unresolved item 331/95009-01 (Section 1.6).

- A known equipment issue adversely impacted the control room operators and presented distractions at an inopportune time (Section 1.7).

The inspectors identified concerns with proper use of measuring and test equipment, and the level of detail in work instructions within the area of **MAINTENANCE**. Additionally, work planning concerns, similar to those in prior inspection periods, continued to arise.

- Work planning issues continued from the previous inspection period. Examples include: (1) correct parts not verified prior to tagging out a well water pump, (2) discrepancies in work instructions regarding required torque values, and (3) lack of proper coordination to support system draining (Section 2.1).

- Measuring and test equipment was used without observing the limitations of a "restricted use" sticker (Section 2.2).

- The lack of procedural guidance to ensure adequate thread protrusion for embedded was considered a weakness (Section 2.3).

The inspectors identified no new substantive concerns within the area of **ENGINEERING**. The inspectors identified further examples of loose piping supports.

- A number of loose supports on system piping identified by the inspectors was an inspection followup item (Section 3.4).

- Management oversight of the Generic Letter (GL) 89-10 program was effective. Program documentation and test data provided an adequate basis to conclude that all GL 89-10 program MOVs would perform their intended safety functions under worst-case design-

basis conditions. One inspection followup item was opened concerning the NRC's review of the acceptability of removing 17 valves from the GL 89-10 program (Section 3.3.1).

The inspectors identified no concerns within the area of **PLANT SUPPORT**.

The inspectors identified both positive and negative examples within the area of **SELF ASSESSMENT AND QUALITY VERIFICATION**. Licensee self-assessments continued to be a strength.

- Following the maintenance on the residual heat removal system, the licensee held a lessons learned meeting to address areas that worked well and those that represented opportunities for improvement (Section 2.1).

- Self-assessments in the MOV area consistently provided good technical findings and effectively monitored the progress made toward program closure (Section 3.3.12).

- The initial discussions associated with the initiation of AR 95-2167 took a broad look at the issues rather that narrowly focusing on the specific instrument involved (Section 2.4).

- Corrective actions were narrow in scope following a trip of the safety-related control building chiller (Section 1.4).

Summary of items opened in this report

Inspection Follow-up Items: identified in Sections 3.3.1 and 3.4

DETAILS

1.0 PLANT OPERATIONS (71707) (92901)

The inspectors observed control room operations, reviewed applicable logs, and conducted discussions with control room operators during the inspection. The inspectors verified the operability of selected emergency systems, reviewed tagout records, and verified proper return to service of affected components. Tours of the reactor and turbine buildings, pump house, and river intake structure were conducted to observe equipment materiel condition and plant housekeeping, and to verify that maintenance work requests had been initiated for equipment in need of maintenance. It was observed that the Plant Manager and Operations Supervisor were well-informed of the overall status of the plant and that they made frequent visits to the control room.

These reviews and observations were conducted to verify that facility operations were in conformance with the requirements established under technical specifications (TS), Title 10 of the *Code of Federal Regulations*, and administrative procedures.

The plant operated at 100 percent power through most of the report period, except for brief periods to conduct turbine valve testing. On December 2-3, 1995, power was reduced to 50 percent for planned maintenance on a feedwater regulating valve actuator.

1.1 Housekeeping and Plant Materiel Condition

Overall, plant materiel condition was good, however, the inspectors noted that a number of materiel condition issues were identified during the inspection period that required the operators to take prompt action and/or resulted in technical specification limiting condition for operation (LCO) entries. While each individual occurrence was of low safety significance, they represented distractions for operators and other plant staff. In each case, the issue was entered into the plant's maintenance process or corrective action process, where appropriate. The examples are listed below:

- "A" control building chiller trip
- "A" reactor water cleanup pump trip
- weeping EHC hydraulic line
- control building air handling unit trip
- uninterruptible power supply batteries for certain control room lights were degraded and had low electrolyte levels

During routine plant inspections, the inspectors noted that the overall condition of the ventilation room, which contains the safety-related standby filter units (SFUs), was not in a condition commensurate with other plant areas. The room was in an infrequently travelled area of the plant and contained numerous minor housekeeping and material condition discrepancies. While the safety significance of the items

noted was low, the inspectors were concerned that the room represented an area that did not receive the same amount of management attention and oversight as other areas of the plant. After the issue was raised, the inspectors noted some improvement to the room's condition; licensee management indicated that efforts would be initiated to bring the room up to the standards in the rest of the plant.

1.2 ESF System Walkdown of 125 Volt Direct Current (VDC) Power Distribution System.

The inspectors performed a detailed walkdown of accessible portions of the 125 VDC power distribution system and identified no concerns. System availability had been high at 99.8 percent. Materiel condition was good and there were few open maintenance action requests on the system. One issue on the operator work around list concerns this system and the remote shutdown panel. Breaker coordination may not prevent loss of 125 VDC system during a postulated fire in the control room. Compensatory measures had been proceduralized to address this issue until the implementation of a modification, which was planned for November 1996.

1.3 Cold Weather Preparations (71714)

The inspectors reviewed the licensee's completed plant winterization checklist and performed walkdowns of several plant areas susceptible to the effects of cold weather. While no concerns were noted, the inspectors planned to continue to monitor the operators' attention to daily plant conditions during cold weather. During the previous winter season, the inspectors noted that although the winterization checklist was completed once at the beginning of cold weather, there were weaknesses in attention to daily plant conditions. See inspection report 50-331/94020(DRP) for details.

1.4 Discrepancy Between Controlled Drawing and Operating Procedure Resulted in Trip of Safety-Related Chiller

The licensee identified that changing a valve position on the safety-related control building chiller resulted in a trip of that unit. The operators noted a discrepancy between the valve description, controlled drawing, and the operating instruction and attempted to trace the piping to resolve the discrepancy. This resulted in an incorrect decision to close a valve that was necessary to be open for proper operation of the unit. The unit tripped within seconds after the valve was closed, and the operator promptly reopened the valve.

Although the operators worked as a crew to attempt to resolve the discrepancy, the inspectors were concerned that the system engineer was not contacted to fully understand the implications before operators changed the position of a valve on a component that was operating properly. Also, the inspectors considered that corrective actions were narrow in scope in this case. The Action Request (AR) written on this issue was closed without followup because another AR was written to correct the drawing; however, there was no discussion of lessons learned from this issue.

1.5 Poor Planning Resulted in Problems During High Pressure Coolant Injection (HPCI) Surveillance

During routine quarterly surveillance testing of the HPCI system, the inspectors observed that operators were challenged and aborted the test due to overflow of a cooling tower basin and rising torus temperatures. The licensee wrote an AR to address the issue and identified three contributing factors: 1) maintenance was authorized on the "A" residual heat removal (RHR) system flow indicator, which reduced available torus cooling down to one train; 2) chlorination of the circulating water system a few hours before the surveillance limited the amount of water that could be discharged to the river, which resulted in limiting the number of RHR service water and emergency service water pumps that could be run without overflowing the cooling tower basin; and 3) there was no full crew briefing prior to the surveillance to fully discuss the implications of the first 2 factors.

The inspectors considered that pre-test planning was poor for this surveillance; however, operators responded promptly to secure the HPCI test before torus temperature approached technical specification limits.

1.6 Emergency Service Water (ESW) Valve Found Out of Position

During operation of the emergency service water system on November 1, 1995, a maintenance technician noted water spraying from a partially open ESW valve near the control building chillers. The valve was promptly closed and no damage occurred. The inspectors were concerned that this valve was found partially open without any tagout or other obvious reason. The licensee's investigation did not determine how the valve was opened, but concluded that possibly the valve may have been bumped during maintenance in the area. A similar issue was identified in inspection report 50-331/95009 regarding several extraction steam valves that were found open instead of closed, as required. In both cases, the licensee was unable to determine the cause. The inspectors will review this issue as part of the closure of unresolved item (50-331/95009-01).

1.7 Downpower to 50 Percent for Planned Maintenance

On December 2-3, 1995, power was reduced to 50 percent for planned maintenance on the feedwater regulating valve. While the conduct of the activities associated with the downpower was good overall, control room operators experienced distractions while returning the unit to full power. When the "B" reactor feedwater pump was started following maintenance, an expected momentary voltage dip on the electrical bus caused the "D" well water pump to trip on undervoltage. While the "D" well water pump automatically restarted, the "B" control building chiller tripped on low well water flow. Efforts to restore the control building chiller configuration presented an unnecessary distraction to the control room operators while they were trying to bring the "B" feedwater pump on line following maintenance.

The fact that the well water pump could trip on undervoltage was known to plant personnel. Past engineering work had installed an automatic restart function for the well water pump. The well water pump did

function as designed and automatically restarted; however, the past work performed to address the expected undervoltage trip of the pump did not prevent the trip of the control building chiller. Subsequent to the end of the inspection period, the licensee informed the inspectors that the issue would be re-opened for further resolution and that the item would be added to the operator work-around list. The inspectors were concerned that a known equipment issue adversely impacted the control room operators and presented distractions at an inopportune time. The inspectors will monitor resolution of this issue in future routine inspections.

No violations or deviations were identified in this area.

2.0 MAINTENANCE AND SURVEILLANCE OBSERVATION (61726,62703,92902)

Station maintenance activities of safety-related systems and components listed below were observed and/or reviewed to verify that they were conducted in accordance with approved procedures, regulatory guides, industry codes or standards, and in conformance with TS.

The inspectors observed safety-related surveillance testing and verified that testing was performed in accordance with adequate procedures, that test instrumentation was calibrated, that limiting conditions for operation were met, that removal and restoration of the affected components were accomplished, that test results conformed with TS and procedure requirements and were reviewed by personnel other than the individual directing the test, and that any deficiencies identified during the testing were properly reviewed and resolved by appropriate management personnel.

The inspectors witnessed portions of maintenance activities on equipment such as RHR valves, a well water pump, feed regulating valves, and control rod drives. The inspectors witnessed portions of test activities on equipment such as river water supply pumps, HPCI system, and reactor vessel narrow range instrumentation. Concerns were identified with work planning, proper use of measuring and test equipment, and work instructions.

2.1 Work Planning Issues

During the report period, the inspectors reviewed several maintenance activities and noted that while most activities were well planned, several minor examples of weak work planning were evident. Although the items were minor in nature, the inspectors also noted similar work planning weaknesses in the previous inspection period (see inspection report 50-331/95009). Examples of poor planning are discussed below:

(1) Operators tagged out the "A" well water pump on November 7, 1995, for replacement of the test valve. However, maintenance personnel had not properly verified the replacement valve to be correct prior to the tag out. Instead, the parts were determined to be incorrect after the system tagout. The operators cleared the tagout to have the system available and the maintenance was rescheduled. The cause of the problem was personnel error.

(2) Due to coordination weaknesses between engineering and maintenance planners, there was a discrepancy between work documents regarding the proper torque value to use when two safety-related river water supply motors were replaced. An AR was written to document this issue and the licensee determined that there were no operability concerns in this case. At the end of the inspection period, the licensee's investigation was still in progress to determine the cause and corrective actions.

(3) Although the overall system work schedule on the residual heat removal (RHR) system during the week of December 4, 1995, was well implemented, the inspectors were concerned that the draining of the system early in the LCO was not well coordinated between operations and radwaste. The maintenance plan had been through the entire 13-week rolling schedule process, but it was not determined until the LCO started that radwaste would have to continuously attend a panel in order to support operation's draining of the system. The licensee determined that the cause was inadequate communication during the planning process.

Following the maintenance week on the RHR system, the licensee held a lessons learned meeting to address areas that worked well and those that represented opportunities for improvement. This was considered to be an excellent initiative on the part of the groups involved.

2.2 Measuring and Test Equipment Used Without Following "Restricted Use" Status

The inspectors observed that valve operation test and evaluation system (VOTES) equipment staged for testing of RHR system motor operated valve (MOV) MO-1904 had a restricted use sticker that indicated "For training only." In response to the inspectors' questions, the licensee wrote an AR and determined that the sticker was left on the equipment in error and was no longer applicable. The equipment was also noted to have been used by several different technicians for testing of numerous MOVs since the date of the sticker. Although the licensee could show that there was no case where the VOTES equipment was not properly qualified for the testing performed, the inspectors were concerned that several technicians did not observe the limitations of the restricted use sticker. The licensee planned to look at technician training and awareness to address this issue.

2.3 Residual Heat Removal Check Valve Thread Engagement Concern

While performing routine plant walkdowns, the inspectors noted questionable thread engagement on the body-to-bonnet studs for valve V20-0006 (RHR minimum flow check valve). While a subsequent engineering analysis determined that the valve was still operable, one of the fastener locations was near the yield shear stress of the material. In addition, four of the eight studs did not have the desired thread engagement. While the analysis revealed that the safety significance of the issue was low, the inspectors were concerned that the occurrence highlighted a weakness, or gap, in the licensee's maintenance procedures. Procedural guidance, and training, is given for thread engagement requirements in cases where nuts are installed on bolts or studs; however no guidance is provided for the cases where a stud or bolt is threaded into a component. The licensee informed the inspectors

that the following actions were planned in response to the issue: procedures would be revised to reflect the additional thread engagement requirements; training would be revised for personnel involved in the affected maintenance activities; and similar valves worked during the same time frame would be checked for adequate thread engagement. The inspectors will monitor the licensee's resolution of this issue during future inspections.

2.4 Half Scram on B-2 Channel

On November 27, 1995, while maintenance technicians were performing STP-41A003-Q (Reactor High and Low Water Level Instrument Channel Functional/Calibration) an unexpected half scram on the B-2 channel occurred. Plant personnel responded appropriately to the signal. The scram signal was verified clear and the half scram reset. Subsequent investigation by the licensee revealed that the most likely cause of the unexpected half scram was bumping of the sensing line for the reactor high pressure switch (PS4552) located on the same instrument rack that the surveillance was being performed on. The licensee initiated AR 95-2167 to document the occurrence and track its resolution. The initial discussions associated with the initiation of AR 95-2167 took a broad look at the issue rather than narrowly focusing on the specific instrument involved.

No violations or deviations were identified in this area.

3.0 ONSITE ENGINEERING (37551)

Selected engineering problems or events were evaluated to determine their root cause(s). The effectiveness of the licensee's controls for the identification, resolution, and prevention of problems was also examined. The inspection included review of areas such as corrective action systems, root cause analysis, safety committees, and self assessment. No substantive concerns or issues were noted as a result of the observed activities.

3.1 Systems Based Instrument and Controls Inspection (SBICI) (93807)

The inspectors performed an inspection using Inspection Procedure 93807, "Systems Based Instrumentation and Control Inspection." Key performance elements evaluated included the setpoint methodology used to develop setpoints, the control of design inputs and setpoints, surveillance testing, measuring and test equipment (MTE) control, and design engineering personnel training. The inspectors concluded that design engineering had implemented a good setpoint program. In addition, the licensee had good controls in place for the other key performance elements evaluated.

The inspectors primarily used Duane Arnold's Individual Plant Examination (IPE) to identify the instrument loops associated with the dominant accident sequences. The following instrument loops were chosen for review:

Calculation Number	Title
CAL-E92-024	Reactor Vessel High Pressure
CAL-E93-004	Loss of Main Condenser Vacuum
CAL-E93-012	High Drywell Pressure - Core Spray Initiation
CAL-E93-026	Low - Low Reactor Water Level
CAL-E93-027	Condensate Storage Tank Low Level
CAL-E93-038	Suppression Pool Area Temperature
CAL-E94-001	High Temperature PCIS Group 1 Isolation
CAL-E95-006	4.16 kV Essential Bus Degraded Voltage

The setpoint calculations had been performed according to the licensee's approved setpoint methodology procedure which followed accepted industry methods.

The inspectors made several notable observations during the course of the inspection. The licensee had an ongoing performance trending program. This program was instrumental in identifying electrolytic capacitor shelf-life concerns. In addition, setpoint drift information was trended for critical plant instruments. Trends for safety-related instruments that indicated the potential for a loss of function typically resulted in expedited corrective actions. Trending reports were provided to plant management and included a justification for taking or not taking corrective actions. The inspectors considered the performance trending program to be a strength. In addition, the inspectors noted that the licensee had in place a means to control design input information contained in surveillance procedures. Procedure calibration tolerances and MTE accuracy were design inputs used in the development of a setpoint and/or total loop accuracy calculation. Duane Arnold was the first licensee to consider this in the six SBICI type inspections performed by Region III. Procedure NGD 106.3, "Procedure Change, Revision, and Cancellation," had acceptable steps for controlling design input information contained in procedures. Changes to this information required an engineering review for setpoint control applicability. Overall, the licensee's control of setpoint information was good.

3.2 Review of Permanent and Temporary Modification Program Implementation

The inspectors reviewed several permanent and temporary modifications. The permanent modifications were installed and tested in an acceptable manner. However, the inspectors noted that documented testing activities for temporary modification 95-202, "To provide Group 3 isolation signal to 1VA0015 A/B, and remove the differential pressure switch signal," were not well defined. In response, the licensee provided the inspectors the operating shift log for August 10, 1995. The log showed that operations had exercised the Group 3 isolation logic for the temporary modification. However, the log did not verify that the two dampers had closed in response to the Group 3 isolation signal. Subsequently, the licensee was able to produce documentation (containment isolation monitoring system (CIMS) printout) that demonstrated the valves had responded correctly to the Group 3 isolation signal. During the debrief with the inspectors on November 3, 1995, the licensee indicated that they could better document temporary

modification testing. Operations indicated that they would work with engineering to provide sufficient detail in procedure 1410.6, "Temporary Modification Control," on how to better document and evaluate temporary modification testing. This was acceptable to the inspectors.

3.3 Generic Letter (GL) 89-10 Program Implementation

The focus of this inspection was to evaluate Duane Arnold Energy Center's (DAEC) process for qualifying the design-basis capability of MOVs and closure of GL 89-10. The inspection concentrated on evaluating MOVs that were tested under static or low differential pressure (dP) conditions. A valve sample that included several program closure methods used by DAEC was selected to verify design-basis capability. The inspectors reviewed design-basis documents, thrust calculations, test packages, and engineering evaluations for the following MOVs:

MO2007	RHR Loop "A" Torus Cooling and Test Return Header
MO2147	Core Spray Pump Torus Suction Inboard Isolation
MO2312	HPCI Feedwater Injection Isolation
MO2517	RCIC Pump Torus Suction Outboard Isolation

3.3.1 Program Scope

The program scope consisted of 75 MOVs (55 gate valve and 20 globe valves). All valves were tested statically and 33 were tested dynamically.

The licensee documented their intention of removing 17 valves from the program in a November 30, 1994, letter to the NRC. The licensee had contended that the design basis of these valves did not include system recovery from so-called "secondary modes of operation," (surveillance testing) in time to support the accident mitigation function. Because the NRC was still reviewing the licensee's position, interim removal from the program was accepted based on capability verification for all 17 valves and existing administrative controls that would keep the valves capable. The current program scope was acceptable for program closure; however, the staff's final disposition of the acceptability of this scope reduction was considered an inspection follow up item (IFI) (50-331/95011-01).

3.3.2 Design-Basis Capability Verification

Overall, DAEC satisfactorily established the design-basis capability of all program MOVs, including those that had not been tested at or near design-basis conditions. Duane Arnold's thrust and torque calculations utilized the standard industry equations with valve mean seat diameter used to calculate valve disc area and a stem friction coefficient of 0.15 used to convert thrust to torque. An assumed valve factor of 0.50 was used for gate valves and 1.10 for globe valves until a dynamic test was performed, or best available data from an industry source was obtained. The licensee justified the valve factor assumptions as discussed in Section 3.3. Torque switch trip or control switch trip was adjusted for diagnostic system uncertainties and torque switch repeatability.

3.3.3 Grouping and Valve Factor Determination

Duane Arnold's grouping methodology generally followed GL 89-10, Supplement 6 guidance. Duane Arnold divided MOVs into 25 valve groups based on manufacturer, valve type, valve size, and ANSI pressure class rating. Only five MOVs relied on grouping as a method for GL 89-10 closure.

To evaluate the licensee's program closure methods, the inspectors reviewed the valve factor (VF) applied to each group and the closure methodology used for each valve within a group. In-plant data was used first, then Electric Power Research Institute (EPRI) prototype data for justification of VFs for non-dynamically tested MOVs. In the few cases where Duane Arnold did not have in-plant data or EPRI prototype data to validate a chosen VF, the EPRI performance prediction model (PPM) was utilized to calculate required thrust. The inspectors noted methodologies and valve groupings which required further explanation. These are discussed below.

- Thrust requirements for valve groups 3, 8, and 20 were determined using the EPRI PPM. A total of 26 valves were evaluated with acceptable results. Because the EPRI PPM is currently under review by the NRC staff, DAEC will be expected to review any applicable information provided by the staff and take appropriate actions, as necessary.

- Valve groups 4, 13, 21, and 22 were acceptable for program closure based primarily on large available thrust margin. Duane Arnold's program allowed closure without EPRI PPM or future grouping if an 80 percent thrust margin about minimum required stem thrust was available. The minimum available safety-direction thrust margins for each valve group ranged from 102 percent to 260 percent. Based on margin in excess of 100 percent, the inspectors considered the grouping adequate for closure.

3.3.4 Stem Friction Coefficient

Duane Arnold's justification for an assumed 0.15 stem friction coefficient (SFC) was considered to be adequate for program closure. Data collected from static testing revealed that 52 tests above 30,000 psi thread pressure showed a mean plus 2 standard deviations value of 0.147. The remaining tests below 30,000 psi thread pressure revealed 7 tests with a SFC greater than 0.15. These 7 tests were reviewed individually by plant personnel to ensure that adequate margin was available using the higher SFC values. A SFC coefficient of 0.20 was used if the SFC could not be measured and the valve experienced a thread pressure less than 30,000 psi. The inspectors were concerned that the licensee's SFC analysis was based on results from static tests, which typically result in lower SFC conditions than under dynamic tests. Dynamic SFCs were reviewed and supported the licensee's conclusions.

3.3.5 Stem Lubricant Degradation

The inspectors considered DAEC's stem lubricant degradation assumptions acceptable for program closure based on the plan to maintain a

15 percent thrust margin on all MOVs, and the continued trending of lubricant degradation. Duane Arnold did not include a margin for stem lubricant degradation since plant test results showed an average thrust difference of only 1.01 percent using Mobil 28 as a stem lubricant. Lubrication intervals between tests varied from 3 to 36 months, with 15 of the tests having intervals greater than 20 months. Duane Arnold plans to continue confirmation of findings in this area via the MOV trending program.

3.3.6 Load Sensitive Behavior

Duane Arnold did not include a margin for load sensitive behavior (LSB) in MOV thrust calculations. The licensee reviewed LSB test results from 46 data points from 24 valves and determined that the test results were random and less than the system uncertainties; therefore, no LSB was present. The data for all 46 separate tests indicated a mean of 0.83 percent with a standard deviation of 4.5 percent. After reviewing the data, the inspectors determined that test results from 23 MOVs may not provide sufficient data to definitively indicate a lack of LSB, but conceded that the data indicated minimal LSB. The inspectors reviewed the MOV thrust margin by applying the 0.83 percent value as a bias, and included two standard deviations of the data set (approximately 9 percent) in the square root of the sum of the squares methodology with other setup uncertainties. No MOVs were found where the thrust margin was inadequate using this methodology. Duane Arnold's use of zero LSB values was acceptable based on current MOV margin and on the minimum 15 percent thrust margin improvement plan maintained for all MOVs. Duane Arnold will be expected to gather confirmatory data on LSB during the periodic verification program.

3.3.7 Evaluation of Diagnostic Equipment Inaccuracies

Incorporation of diagnostic uncertainty in the establishment of the thrust window and in the test data evaluation process was determined to be appropriate and sufficient for program closure.

3.3.8 Pressure Locking (PL) and Thermal Binding (TB)

The licensee documented ten valves as potentially susceptible to PL in a report dated August 12, 1994. During the last refuel outage, seven of the ten valves were modified to address the concerns and the other three valve modifications were scheduled for the 1996 refuel outage.

Because one unmodified valve, MO-1905 (RHR loop B low pressure coolant injection (LPCI) inboard injection valve), did not have the capability under degraded voltage conditions to overcome an analyzed PL condition, the licensee realigned the system by opening valve MO-1905 and closing an upstream globe valve, MO-1904. Both valves received the same safety signals and were capable of performing the required safety functions. This was determined to be acceptable.

During the PL/TB scope review, the inspectors noted some valves incorrectly described as gate valves in the in-service test (IST) program. In response, DAEC initiated action to address the inconsistencies in the IST documents. The area of PL/TB will be

reevaluated in the future under the guidance of GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves."

3.3.9 Periodic Verification of Design-Basis Capability

Duane Arnold's plans for periodic verification (PV) of MOV design-basis capability were satisfactory for program closure. The approach will include a combination of static and dynamic testing based on margin available, valve trend information, and safety significance. Static testing will be performed for all MOVs within the GL recommended frequency of 5 years. To evaluate assumptions for age degradation, DAEC planned to diagnostically dP test 10 percent of the MOVs that are meaningful to test every refuel cycle.

The NRC staff is preparing a GL on the PV of MOV design-basis capability and will review the PV program in greater detail following issuance. Duane Arnold should review its program and consider the benefits (such as identification of decreased thrust output and increased thrust requirements) and potential adverse effects (such as accelerated aging or valve damage) when determining appropriate periodic verification testing for each MOV.

3.3.10 Post-Maintenance Testing

Post-maintenance testing (PMT) requirements for MOV related activities were considered detailed and well organized and were satisfactory for program closure. The comprehensive guidelines addressed PMT for actuator and valve work. The program required the performance of diagnostic testing following valve packing replacements/adjustments and dynamic diagnostic testing was required following valve internal work that could affect thrust requirements.

3.3.11 MOV Failure Trending and Corrective Actions

Duane Arnold's trending program was relatively new but appeared capable of adequately tracking and evaluating data to maintain MOV design-basis capability. The computer based trending program will track and trend MOV performance parameters, failures and corrective maintenance actions and, where applicable, will include normal and alarm ranges for the parameter monitored. Tracking and trending reports will be prepared once per fuel cycle. Although the information in the computer database at the time of the inspection was limited, the inspectors noted that DAEC was in the process of expanding the database.

3.3.12 Licensee Self-Assessment

Self-assessments in the MOV area consistently provided good technical findings and monitored the progress made toward program closure. Corrective actions to the issues raised during the assessments were addressed or were considered for program enhancements. The most recent audit employed an outside MOV technical specialist.

3.4 Loose Piping Supports Identified

While performing plant walkdowns, the inspectors noted several questionable or damaged piping supports associated with the RHR system and other piping in the vicinity. The inspectors were informed that a past water-hammer event occurred in the RHR system and may have been a contributor to some of the discrepancies noted. The licensee initiated AR 95-1693 to document the issues and track their resolution. Pending further discussion with licensee personnel about the past event and its associated corrective actions, and inspector review of the closure of AR 95-1693, this was considered an IFI (50-331/95011-02).

No violations or deviations were identified in this area. Two IFI's were identified.

4.0 PLANT SUPPORT (71750)

Selected activities associated with radiological controls, radiological effluents, waste treatment, environmental monitoring, physical security, emergency preparedness, and fire protection were reviewed to ensure conformance with facility procedures and/or regulatory requirements. No substantive concerns or issues were identified.

No violations or deviations were identified in this area.

5.0 FOLLOW-UP ON PREVIOUSLY OPENED ITEMS (92902,92903)

(Closed) Violation 50-331/93019-01a(DRS): No acceptance limits were established to control the maximum motor current input. Duane Arnold's VOTES Test Evaluation Package, which was completed prior to returning the MOV to service, was revised to include the appropriate evaluation of open running current, unseating current, close running current, and seating current. This item is closed.

(Closed) Violation 50-331/93019-01b(DRS): MO-1937 was returned to service prior to evaluation and documentation of test results which verified MOV operability. In response, Duane Arnold's VOTES Test Evaluation Package was revised requiring the evaluation and documentation of the appropriate acceptance criteria prior to declaring MOVs as operable. The procedures were reviewed and found to be acceptable. This item is closed.

(Closed) Unresolved Item 50-331/93019-03(DRS): Assumptions in calculating the MOV degraded voltage and in evaluating MOV capability under degraded voltage conditions were nonstandard and potentially nonconservative. In response, DAEC appropriately revised the degraded voltage calculations using standard industry sizing equations which included nameplate torque, the appropriate power factor, and the appropriate application factor. The inspector's review of sample calculations raised no further questions. This item is closed.

(Closed) Violation 50-331/93019-05(DRS): Failure to take corrective action to address a potential nonconforming condition for the RHR shutdown cooling outboard suction valve, MO-1909, after VOTES testing. Because a more detailed engineering operability evaluation was not

required, operability was based on "in field" acceptance criteria. The licensee revised the engineering acceptance criteria and determined the valve was operable. A reevaluation of all VOTES tests prior to, and including, RFO 12 was performed and no valves were found inoperable. The licensee also revised the maintenance directive for planning Limitorque MOV VOTES testing to include a requirement that the engineering evaluation of VOTES data was to be completed prior to returning a valve to operable status. This item is closed.

(Closed) Information Follow up Item (50-331/94002-01(DRP)): Follow up on the licensee's electrolytic capacitor shelf-life (aging) program. The licensee identified critical electrolytic capacitors whose failure could initiate a reactor scram or affect power generation. Program Engineering developed evaluation criteria to determine when an installed capacitor should be replaced or removed from spare parts. Replacement of installed electrolytic capacitors was being controlled by the preventative maintenance program. In addition, new capacitor purchase orders specified date code information to ensure capacitors were not shipped from old stock. Capacitors less than 5 years old and used in safety-related applications were tested prior to installation. Spare electrolytic capacitors and circuit boards containing critical capacitors were red-tagged in the warehouse to verify capacitor date codes prior to use. The inspectors walked down several circuit boards located in the warehouse and concluded they were properly tagged. The inspectors concluded the licensee had implemented a good program to address electrolytic capacitor shelf-life concerns. This item is closed.

(Closed) Violation (50-331/95005-01(DRS)): The licensee failed to ensure that a qualified instrument and control (I&C) technician was used to calibrate three safety-related instruments. In response, the licensee verified that the three calibrations had been performed satisfactorily. In addition, the licensee developed a new I&C technician Qualification Matrix. The matrix clearly delineated the maintenance task qualification for each technician. The I&C foreman used the matrix to assign work to qualified technicians. A quality assurance (QA) surveillance was performed in May 1995 as part of the corrective actions for the violation. Approximately 100 maintenance action requests were reviewed and QA concluded that qualified technicians were assigned to maintenance activities. The inspectors noted that I&C supervision and the technicians were aware that a qualified technician had to be assigned to a maintenance task. The inspectors reviewed an additional 42 safety-related calibration records and concluded that a qualified technician participated in each calibration. This item is closed.

6.0 LICENSEE EVENT REPORT (LER) FOLLOW UP (92700)

Through direct observations, discussions with licensee personnel, and review of records, the following event reports were reviewed to determine that reportability requirements were fulfilled, immediate corrective actions were accomplished, and corrective actions to prevent recurrence had been accomplished in accordance with TS.

(Closed) LER 50-331/94012, Revision 0: Essential bus degraded voltage relays were discovered out of adjustment due to the testing power source having excessive harmonic distortion. In response, the licensee immediately recalibrated the eight degraded voltage relays using a line corrector between the testing power source and the relay to remove any harmonic distortion. All eight relays were successfully recalibrated. Surveillance procedure STP-42B030-A, "4 kV Emergency Bus Degraded Voltage Annual Calibration," was revised to use the line corrector during future relay calibrations. The inspectors concluded the licensee's corrective actions were good. This item is closed.

(Closed) LER 50-331/95009, Revision 0: Primary containment isolations occurred due to the undervoltage trip of electrical protection assembly (EPA) breaker EPA-B2. In response, the licensee placed the "B" RPS bus on its alternate power supply and reset all of the isolations. The EPA undervoltage trip setpoint was found in calibration. Troubleshooting activities discovered a loose (finger tight) exciter rectifier in the "B" motor-generator set. The licensee verified the torque value (30 inch-pounds) for the remaining exciter rectifiers. The other two rectifiers were correctly torqued. Extensive testing did not identify any other problems. The loss of a rectifier does have the potential to decrease motor-generator set output voltage. A maintenance action request was written to verify the exciter rectifier torque values for the "A" motor-generator set. This will be completed in a future outage. The inspectors reviewed GEK-30496, "Motor-Generator Package Set for RPS." The GEK identified the motor-generator set as a brushless machine that required little or no maintenance. Exciter rectifier torque verification was not a recommended maintenance activity. The inspectors concluded the licensee had addressed the EPA trip in an acceptable manner. This item is closed.

No violations or deviations were identified in this area.

7.0 DEFINITIONS

Inspection Follow up Items (IFI)

Inspection follow up items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee, or both. Two IFIs disclosed during the inspection are discussed in Sections 3.3.1 and 3.4.

8.0 PERSONS CONTACTED AND MANAGEMENT MEETINGS

The inspectors contacted various licensee operations, maintenance, engineering, and plant support personnel throughout the inspection period. Senior personnel are listed below.

At the conclusion of the inspection on December 14, 1995, the inspectors met with licensee representatives identified below and summarized the scope and findings of the inspection activities. After discussions with the licensee, the inspectors determined there was no proprietary information contained in this inspection report.

J. Franz, Vice President Nuclear
G. Van Middlesworth, Plant Manager
R. Anderson, Manager, Outage and Support
R. Anderson, Operations Supervisor
P. Bessette, Acting Manager, Nuclear Licensing
J. Cantrell, Manager, Nuclear Training
T. Gordon, Acting Maintenance Superintendent
R. Hite, Manager, Radiation Protection
M. McDermott, Manager, Engineering
K. Peveler, Manager, Corporate Quality Assurance