U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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License No:	DPR-49 EA 97-334
Report No.	50-331/97011(DRP)
Licensee:	IES Utilities Inc. 200 First Street S.E. P. O. Box 351 Cedar Rapids, IA 52406-0351
Facility:	Duane Arnold Energy Center
Dates:	May 18 - July 3, 1997
Inspectors:	C. Lipa, Senior Resident Inspector M. Kurth, Reactor Engineer
Approved by:	Michael J. Jordan, Chief Reactor Projects Branch 5

EXECUTIVE SUMMARY

Duane Arnold Energy Center
NRC Inspection Report 50-331/97011(DRP)

The inspectors identified concerns with a test procedure and the failure to perform a safety evaluation prior to performing a test in an abnormal configuration.

Operations

- The inspectors were concerned that operators failed to fully evaluate the effect on plant operation before performing turbine stop valve testing in an abnormal plant configuration. This was a violation of 10 CFR 50.59. (Section 01.2)

Maintenance

- The licensee failed to incorporate the results of a 1990 analysis into test procedure prerequisites. (Section M3)

Engineering

- Following suspension of turbine valve testing on May 18, 1997, engineering effectively provided support to operations to continue turbine valve testing in the three steam line configuration. (Section E1)

Report Details

Summary of Plant Status

The plant began this inspection period at 100 percent power. On May 18, 1997, power was reduced to approximately 65 percent for main steam isolation valve (MSIV) testing and a control rod sequence exchange. During testing, the "C" inboard MSIV failed to indicate fully closed. The "C" outboard MSIV was closed and deenergized to comply with Technical Specifications for containment isolation. With one steam line isolated, power was limited administratively to approximately 80 percent until a shutdown was commenced on May 23 to repair the "C" inboard MSIV limit switch.

I. Operations

01 Conduct of Operations

01.1 General Comments (71707)

The inspectors conducted a review of plant operations associated with the MSIV limit switch issue. This included observing control room activities, attending shift turnovers and crew briefings. In general, conduct of operations was professional and shutdown and start-up activities were well controlled. However, concerns were identified with turbine stop valve (SV) testing as detailed in the sections below.

O1.2 Turbine Stop Valve Testing With One Steam Line Isolated Without a 50.59 Safety Evaluation

a. Inspection Scope

The inspectors observed portions of control room activities on May 18, 1997 following the identification of a failed limit switch on the "C" inboard MSIV. Activities included a control rod sequence exchange, installation of a temporary modification of the "C" outboard MSIV, and part of the turbine valve testing surveillance.

b. Observations and Findings

On May 18, 1997, during routine quarterly MSIV testing, the licensee identified that the "C" inboard MSIV failed to indicate fully closed. The licensee subsequently closed and deenergized the "C" outboard MSIV to meet containment isolation requirements per Technical Specification 3.7.B.2.

A short time later that day, with the plant at approximately 75 percent power, the licensee began surveillance test NS-93001, "Main Turbine Operational Testing." Step 7.1.13 specified to depress and hold test button for turbine stop valve SV-2, which is on the "D" main steam line. Panel 1C05 has four flow indications, one for

each of the four main steam lines. Before the test, the flow indication for "C" was close to zero because of the outboard MSIV closed, and flow indication for "A", "B", and "D" steam lines was approximately 1.8 million lb/hr each. As SV-2 was cycled, the flow indication for "D" main steam line went down to approximately 0.7 million lb/hr, and the indication for "A" and "B" steam lines went upscale (>2 million lb/hr). The operators promptly suspended testing when the indication went upscale. However, the inspectors had several concerns:

1) Before the test, the inspector questioned the shift supervisor about the plant effect of performing the scheduled surveillances with the plant in the 3 steam line configuration. The Shift Supervisor stated that there were no prerequisites in the surveillances that required all 4 steam lines. He also indicated that he expected no adverse effects of the testing. Following the test, the inspector was made aware that discussions had also taken place before the test between the Shift Technical Assistant, Shift Manager, Assistant Operations Supervisor, Shift Supervisor, System Engineer, and Plant Manager. They determined that no significant plant effect was expected due to the equalizing manifold downstream of the MSIVs.

2) Operations did not fully consider the plant effect of performing the SV testing in the abnormal plant configuration (one steam line isolated). The only prerequisite for the SV testing in NS-93001 was reactor power <95 percent. Plant management and Engineering were consulted, however, no attempt was made to estimate the increase in steam flow through the "A" and "B" steam lines as a result of closing SV-2.

3) The turbine stop valve testing was not described in the updated facility safety analysis report. There was no 10 CFR 50.59 safety evaluation to support performing the SV testing at 75 percent power with one steam line isolated.

4) Design of the control room steam flow indication limited the maximum detectable steam flow to 2 million lb/hr. This was not recognized by Operations, who on May 18, thought that the maximum <u>actual</u> flow in the "A" and "B" line was only 2 million lb/hr (approximately 112 percent of normal rated steam flow). On May 23, 1997, Engineering calculated that actual steam flow through "A" and "B" steam lines was approximately 133 percent of normal rated steam flow, which is close to the Group 1 setpoint (approximately 135-137 percent rated steam flow). As a result, operators inadvertently put the plant in a condition close to the setpoint, which would have resulted in a full group 1 isolation and reactor scram when 3 of 4 MSIVs were <90 percent open.

5) As discussed in Section M3, below, the licensee failed to incorporate the results of a 1990 safety analysis that concluded that power should be reduced to 55 percent power in order to perform the SV testing.

c. Conclusions

The inspectors concluded that Operations failed to fully evaluate the potential plant effect of performing the turbine valve testing while in the three steam line configuration. 10 CFR 50.59 requires a written safety evaluation which provides the bases for the determination that the test does not involve an unreviewed safety question. Failure to perform the written safety evaluation for performing SV testing with only three steam lines open is a violation of 10 CFR 50.59 (50-331/97011-01). This resulted in the reactor plant being much closer to a Group I Isolation and reactor scram than anticipated. Although analysis subsequent to the event determined that an unreviewed safety question was not involved, this was not known before the testing was started. Also, the results of the 1990 analysis were not incorporated into the test procedure as prerequisites. In response to the event, the licensee initiated a root cause analysis and issued a level 3 Action Request (AR 97-1290) to determine and document the causes and corrective actions.

II Maintenance

M3 Maintenance Procedures and Documentation

a. Inspection Scope

The inspectors followed the licensee's review of the turbine stop valve testing of May 18. The licensee identified that an analysis and safety evaluation had been performed in 1990 to review performing the turbine valve testing while in the three steam line configuration. However, the results of the analysis had not been incorporated into the test procedure.

b. Observations and Findings

An analysis performed on May 1, 1990, titled "Design Considerations Associated with Three Steam Line Operation," concluded that turbine valve testing surveillances should be performed at 55 percent power or less with the plant in a three steam line configuration. Portions of the analysis were incorporated into plant procedures. However, appropriate prerequisites were not included in Surveillance Test Procedure NS-93001, "Main Turbine Operational Testing," Revision 8 to require power to be reduced to 55 percent or less in order to perform the testing when the plant was in a three steam line configuration. Operations was not aware of the analysis until after the test was suspended.

c. Conclusions

The inspectors were concerned that the results of the analysis were not fully incorporated into the plant procedures. This was considered to be a weakness.

III Engineering

E1 Conduct of Engineering

a. Inspection Scope (37551)

The inspectors evaluated engineering involvement in resolution of emergent material condition problems and other routine activities. The inspectors reviewed areas such as operability evaluations, root cause analyses, safety committees, and self assessments. The effectiveness of the licensee's controls for the identification, resolution, and prevention of problems was also examined.

b. Observations and Findings

The inspectors reviewed engineering evaluations of issues such as MSIV limit switch failure and torus vacuum breaker limit switch failure In each case, engineering promptly addressed and resolved the issues.

Following the suspended turbine valve testing on May 18, 1997 (see Section 01.2), engineering located an evaluation dated May 1, 1990 that provided engineering considerations associated with three steam line operation. By May 23, 1997, engineering conducted a line by line review of the 1990 evaluation to determine if the constraints and considerations used at the time were still valid. The review included all plant modifications performed since May 1990. Following this review, engineering provided limitations to allow Operations to conduct the turbine valve testing in the three steam line configuration.

c. Conclusions

The inspectors concluded that engineering effectively resolved the identified materiel condition issues and provided support to operations to enable the continuation of turbine valve testing in the three steam line configuration.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on June 19, 1997. A re-exit was held July 3, 1997, with the Plant Manager and Operations Manager. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Franz, Vice President Nuclear
G. Van Middlesworth, Plant Manager
J. Bjorseth, Maintenance Superintendent
D. Curtland, Operations Manager
M. McDermott, Manager, Engineering
K. Peveler, Manager, Regulatory Performance

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observation
IP 62707:	Maintenance Observati
IP 71707:	Plant Operations
IP 92901:	Followup - Operations
IP 92902:	Followup - Engineering

ITEMS OPENED AND CLOSED

Opened

50-331/97011-01 NOV Failure to Perform 50.59 Safety Evaluation Prior to SV Testing.

Closed

LIST OF ACRONYMS USED

AR	Action Request
CFR	Code of Federal Regulations
DAEC	Duane Arnold Energy Center
NRC	Nuclear Regulatory Commission
MSIV	Main Steam Isolation Valve
SV	Stop Valve
URI	Unresolved Item