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February 4, 2000
NG-00-0180

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station 0-P1-17
Washington, D. C. 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Licensee Event Report #2000-001
File: A-120

Dear Sirs:

Please find attached the subject Licensee Event Report submitted in accordance with 10CFR50.73. The following new commitment is made in this letter.

STP 3.3.3.2-01, Remote Shutdown System Instrument Calibration, will be revised prior to the next performance to include explicit instructions on restoring LT 4541.

Should you have any questions regarding this report, please contact this office.

Sincerely,

Kenneth E. Peveler for

Richard L. Anderson
Plant Manager - Nuclear

cc: Mr. James Dyer
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532

NRC Resident Inspector - DAEC
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2NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(6-1998)

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Duane Arnold Energy Center	05000331	1 OF 7

TITLE (4)

Automatic Reactor Scram While Restoring Level Transmitter to Service

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	05	2000	2000	- 001 -	00	02	04	2000	FACILITY NAME	DOCKET NUMBER

OPERATING	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)(C)		Specify in Abstract below or in RC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Clara Rushworth, Licensing Engineer	(319) 851-7157

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On January 5, 2000, with the plant operating at 100% power, an automatic scram occurred when technicians attempted to restore a level transmitter to service after calibration. All control rods inserted, and primary containment isolations (Groups 2, 3 and 4) occurred as expected. A partial Group 5 isolation also occurred. Reactor water level control following the scram was complicated by a positive bias on a feedwater regulating valve and a recirculation motor generator runback failure, but vessel level and pressure were maintained within safe operating limits. There were no emergency core cooling system actuations and no safety relief valve openings. The plant was re-started on January 9, 2000. This event had no effect on the safe operation of the plant.

The scram signal resulted from a false low level signal generated due to an inadequate instrument restoration process. Corrective actions will include enhancements to training and calibration practices, and procedure revisions.

I. DESCRIPTION OF EVENT:

On January 5, 2000, the Duane Arnold Energy Center (DAEC) was operating at 100% power; Surveillance Test Procedure (STP) 3.3.3.2-01 (Remote Shutdown System Instrument Calibration) was in progress. At 1209, an automatic scram occurred when Instrument and Controls (I&C) technicians attempted to return the wide range (flood-up) reactor vessel level instrument level transmitter (LT) LT4541 to service following calibration during the STP.

At that point in the STP, LT4541 had been isolated, drained and vented. Level transmitter LT4541 is tied to level indicating switches (LISs) LIS4592A (Reactor Vessel Low Level Reactor Protection System trip) and LIS4592B (Reactor Vessel Low Level Reactor Protection System trip) by a common sensing line. When the technicians attempted to return LT4541 to service by opening LT4541-V-93 (LT4541 manifold high pressure isolation valve), an inrush of water filled the void in the transmitter and instrument line between the isolation valve and transmitter. The inrush of fluid caused a temporary drop in pressure in the sensing line, which was also felt by LIS4592A and LIS4592B. The scram was caused by the actuation of both LIS4592A and LIS4592B and all control rods fully inserted into the core. There were no Emergency Core Cooling System (ECCS) actuations and no Safety Relief Valve (SRV) openings during the event. The reactor was re-started on January 9, 2000.

As expected on a reactor scram from 100% power, level initially dropped following the scram due to core void collapse. The "A" recirculation motor generator (MG) set failed to runback to minimum causing the indicated reactor water level to drop to a slightly lower level than would otherwise be expected for a transient of this type (approximately 132"). Reactor level control was complicated by a positive bias on one feedwater regulating valve preventing its full closure. As a result, reactor water level rose above 211", causing main turbine, reactor feedwater pump and high pressure coolant injection (HPCI) turbine high level trips. (HPCI was not running at this time.) Subsequently, the bias problem was recognized and corrected.

As mentioned previously, the "A" recirculation MG set failed to run back to 20%. The 20% runback is designed to occur if total feedflow is less than or equal to 20% for more than 15 seconds or the recirculation pump discharge valve is not fully open. (The 20% runback is not a safety-related feature.) The runback failure occurred due to a failed set of contacts on relay B31-K023A (total feedflow <20% for more than 15 seconds time delay relay) This prevented the 20% runback relay from de-energizing and providing the 20% runback. Relay B31-K023A was replaced prior to plant restart.

Following the scram, during the level transient, Primary Containment Isolation System (PCIS) isolations occurred. Group 2 (RHR sump and Drywell drains, etc.), Group 3 (Reactor Building Isolation), and Group 4 (Primary Containment Isolation Signal for Shutdown Cooling) automatic isolations occurred as expected. A partial Group 5 automatic isolation occurred as well, and was taken to completion by the operating crew.

The partial Group 5 isolation involved the outboard Reactor Water Cleanup (RWCU) valves. This isolation is designed to occur at a nominal low-low level of 119.5". The lowest computer-indicated reactor water level (132.5") was higher than 119.5". A review showed that when the effects of various inaccuracies, such as calibration tolerances and trip switch inaccuracy, are taken into account, the level transient was sufficient to cause a low-low level signal and result in a partial Group 5 isolation.

II. CAUSE OF EVENT

As described above, the cause of the scram was a false low reactor water level signal generated during an attempt to valve-in level transmitter LT4541 following calibration during STP 3.3.3.2-01 (Remote Shutdown System Instrument Calibration). The calibration of that LT had been added to that STP in 1998 during the DAEC's conversion to Improved Technical Specifications (ITS).

The false signal was generated because of the use of an inadequate instrument restoration process. Several factors contributed to the I&C technicians using this inadequate process:

1. Unclear management expectations and standards,
2. Ineffective pre-job brief,
3. Incomplete procedural guidance,
4. System design, and
5. Training weaknesses.

1. Unclear management expectations and standards

A standard process for filling, venting, repressurizing and returning LTs to service is not documented and there is inconsistent procedural guidance for the task. In July of 1998, another technician had successfully performed the calibration using STP 3.3.3.2-01; however, he apparently used a different method to restore the LT and so avoided a scram.

2. Ineffective pre-job brief

A pre-job briefing was conducted prior to the performance of the STP, but it did not specifically address the need to fill, vent and pressurize the level transmitter prior to return to service.

3. Incomplete procedural guidance

The STP did not contain explicit steps concerning the restoration of the instrument to service, such as step-by-step instructions for filling, venting, and repressurizing, as STPs typically do. The STP did not contain a precaution regarding the shared sensing line or the possibility that a scram could result. The STP review process did not identify these procedural weaknesses when the calibration of LT4541 was added to STP 3.3.3.2-01 in 1998. Actions taken in response to INPO Operations and Maintenance Reminder (O&MR) 425 (Air Entrapment and Inappropriate Valve Operations during Maintenance and Calibration of Instrumentation) also failed to identify these weaknesses in STP 3.3.3.2-01.

The return to service instructions referred the technician to another procedure that also has no detailed instructions. Also, STP 3.3.3.2-01 deals with the Remote Shutdown Panel, which appears to have led to a false sense of security that this LT would not affect the plant.

4. System design

Several instrument configurations have common sensing lines. Some instruments are installed in configurations that are difficult to vent and fill because of the tubing configuration.

5. Training weaknesses

The training laboratory guide for filling and venting of instruments does not include repressurization and return to service as part of the training for all technicians.

In December of 1998, INPO issued O&MR 425 (Air Entrapment and Inappropriate Valve Operations during Maintenance and Calibration of Instrumentation) which discussed this type of event. While the O&MR was reviewed for inclusion in I&C training and included in continuing training in June/July of 1999, this failed to prevent the event.

III. ANALYSIS OF EVENT

Throughout the event, reactor vessel level and pressure were maintained within safe operating limits. All control rods inserted upon receipt of the sensed low water level signal. The Reactor Protection System (RPS) is designed to automatically keep the reactor from operating in an unsafe condition by shutting down the reactor whenever prescribed limits are exceeded. This actuation of the RPS was a result of sensed low reactor water level during the performance of a surveillance and not due to any actual reactor safety parameter being exceeded. There were no actual safety consequences impacting plant or public safety as a result of the event. The RPS functioned as designed and plant operators took appropriate actions during this event.

IV. CORRECTIVE ACTIONS

From January 11, 2000 to January 13, 2000, an INPO assist visit was conducted to investigate the event. The team found no major deficiencies in the DAEC's practices, but pointed out several areas where improvements can be made. The DAEC's review of the team's evaluation is on-going.

Management talked to the maintenance shops to heighten awareness of the event and reinforce the need for self-checking. An "all hands" meeting was held on January 14, 2000 to discuss the event and reinforce management expectations.

Additional corrective actions for Causes 1 through 5 are discussed below.

1. Unclear management expectations and standards

Management expectations and standards for filling, venting and repressurizing instruments have been determined, and will be documented and provided to I&C technicians, as well as to the Procedures Department to aid in STP revisions.

2. Ineffective pre-job brief

Expectations for pre-job briefs will be evaluated and provided to plant personnel. These expectations will include that supervisors review procedures before the briefing. Expectations for the persons being briefed (so that they are prepared to discuss challenges and add value to the briefing) will be provided to plant personnel.

3. Incomplete procedural guidance

STP 3.3.3.2-01, Remote Shutdown System Instrument Calibration, will be revised prior to the next performance to include explicit instructions on restoring LT 4541.

Other instrument STPs have been reviewed to ensure that they contain sufficient procedural guidance and cautions to prevent a sensed level transient on other instruments similar to what caused the plant trip. These STPs are being revised, as appropriate, prior to their next performance.

In addition, the STP review process will be evaluated for potential enhancements.

4. System design

Instrument calibration practices in use at a similar plant will be assessed to identify potential improvements for use at the DAEC. Also, the DAEC will evaluate modifying instrument and valve labels to enhance human factoring on instruments with shared sensing lines.

5. Training weaknesses

Enhancements to I&C training on instrumentation filling, venting, repressurizing and restoring to service will be implemented.

Initial and continuing I&C training will be evaluated to ensure adequate training is given on the effects of system configuration and instrument sensing lines connected to the reactor vessel.

All corrective actions necessary to ensure safe operation were completed prior to restart. The above corrective actions are additional enhancements that have been entered into the DAEC corrective action program (Action Requests 18262 and addenda).

V. ADDITIONAL INFORMATION

A. Previous Similar Events

LER 90-12 reported a scram signal (while shutdown) during restoration of a level transmitter. LERs 96-04, 96-02 and 95-07 discuss I&C related Engineered Safety Feature actuations.

B. EIIS System and Component Codes

Reactor Recirculation Pump System--AD
Primary Containment Isolation System--JM
Feedwater Regulating Valve Controller--PMC
Engineered Safety Features Actuation System--JE
Level Transmitter--LT
Level Indicating Switch--LIS

This report is being submitted pursuant to 10CFR50.73(a)(2)(iv).