



FPL Energy.

Duane Arnold Energy Center

FPL Energy Duane Arnold, LLC
3277 DAEC Road
Palo, Iowa 52324

May 17, 2007

NG-07-0450
10 CFR 50.73

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Licensee Event Report #2007-006-00

Please find attached the subject Licensee Event Report (LER) submitted in accordance with 10 CFR 50.73. This letter makes no new commitments or changes to any existing commitments.

Gary Van Middlesworth
Site Vice President, Duane Arnold Energy Center
FPL Energy Duane Arnold, LLC

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Resident Inspector, DAEC, USNRC

JE22

LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollect@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

1. FACILITY NAME

Duane Arnold Energy Center

2. DOCKET NUMBER

05000 331

3. PAGE

1 OF 5

4. TITLE

Reactor Shutdown as a Result of a Chemistry Excursion

5. EVENT DATE

MONTH	DAY	YEAR
03	18	2007

6. LER NUMBER

YEAR	SEQUENTIAL NUMBER	REV NO.
2007	6	0

7. REPORT DATE

MONTH	DAY	YEAR
05	17	2007

8. OTHER FACILITIES INVOLVED

FACILITY NAME	DOCKET NUMBER
	05000
FACILITY NAME	DOCKET NUMBER
	05000

9. OPERATING MODE

1

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

- | | | | |
|---|---|--|--|
| <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) |
| <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
| <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
| <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input type="checkbox"/> 50.73(a)(2)(ix)(A) |
| <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) |
| <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) |
| <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> OTHER |
| <input type="checkbox"/> 20.2203(a)(2)(vi) | <input type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | Specify in Abstract below
or in NRC Form 366A |

10. POWER LEVEL

28

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Bob Murrell, Engineering Analyst

TELEPHONE NUMBER (Include Area Code)

(319) 851-7900

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

CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO15. EXPECTED
SUBMISSION
DATE

MONTH DAY YEAR

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

On March 18, 2007, while operating at 28% power, a chemistry excursion occurred shortly after Condensate Filter Demineralizer 1T-13D was placed in service. The magnitude of the chemistry excursion required operators to shutdown the reactor in accordance with abnormal operating procedures and plant chemistry procedures. As a result of inserting the manual scram, Primary Containment Isolation System (PCIS) groups 2, 3, and 4 isolations occurred when reactor water level dropped below 170 inches. All isolations went to completion. The reactor water level decrease is normal following a scram from 28% power due to void collapse in the reactor vessel. Reactor water level was subsequently restored to normal and the PCIS group isolations were reset.

Troubleshooting subsequently determined that the chemistry excursion was the result of resin intrusion from Condensate Filter Demineralizers into the Condensate System.

There were no actual safety consequences and no effect on public health and safety as a result of this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Duane Arnold Energy Center	05000331	2007	-- 006	-- 00	2 of 5

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

I. Description of Event:

On March 18, 2007, while operating at 28% power, a chemistry excursion occurred shortly after Condensate Filter Demineralizer 1T-13D was placed in service.

A chemistry transient occurred on 3/18/07 as a result of an earlier transfer of resin from the influent to effluent piping of the Condensate Filter Demineralizer (F/D) System. Resin transferred from Condensate Filter Demineralizers that were left in HOLD after the Condensate System was secured during the first week of the plant refueling outage. With a F/D vessel pressurized and the Condensate System secured, resin was transferred from the F/D vessel into the Condensate System as follows:

- With the F/D pressurized and the Condensate System secured, influent header pressure equalizing valves SV-1715A (B, C, D, E) will lift off their seat allowing flow from the F/D vessel to the influent header and into the Condensate System.
- Leakage through Condensate F/D Influent Header Isolation Valves CV-1718A (B, C, D, E) allows flow from the F/D vessel to the influent header and into the Condensate System.
- During the backwash cycle, the F/D vessel is pressurized by service air and for a short period of time the hold pump is off. Leakage past the influent and pressure equalizing valve allowed resin with high concentrations of contaminants to pass through to the influent header.
- Leakage past the influent valves and influent pressure equalizing valves caused an undetected loss of suction on several operating Hold Pumps due to low level in the F/D vessel. This condition resulted in the release of resin from filter elements, accumulating in the bottom of the F/D vessel from which it leaked into the Condensate system via the flow paths noted above.

When the plant restored the Condensate System in preparation for plant startup, the bypass valve around the Condensate F/D system was open. After starting the first condensate pump on 3/13/07, flow moved resin that had previously leaked into the influent header to the effluent header through the bypass line. Resin subsequently accumulated in a dead leg section of piping on the effluent side of Condensate F/D Vessels D and E.

Condensate F/D's A, B, and C were placed in operation at various times after 3/13/07 to support long path cleanup and Condensate System startup. Condensate F/D A was removed from service on 3/14/07 due to high conductivity and placed in HOLD. On 3/18/07 with the plant operating at ~30% power, conductivity was observed to be increasing and chemistry requested that operations place an additional F/D in service.

The Control Room Supervisor directed that F/D D be placed in operation. Immediately after placing F/D D in operation a significant increase in effluent conductivity occurred.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 of 5
		2007	-- 006 --	00	

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

When F/D D was placed in service the resin that had accumulated in the dead leg of effluent piping was pumped forward into the reactor. A resin intrusion occurred, resulting in an increase in reactor water conductivity to 33 $\mu\text{S}/\text{cm}$ and sulfate concentration to 4000 ppb (normal conductivity is $\sim 0.055 \mu\text{S}/\text{cm}$ and normal sulfate concentration is <1 ppb). After conductivity and sulfate levels exceeded Action Level 3 of Plant Chemistry Procedure (PCP) 1.9, a reactor shutdown and cooldown of the RPV was performed in accordance with Abnormal Operating Procedure (AOP) 639 and PCP 1.9.

The magnitude of the chemistry excursion required operators to shutdown the reactor in accordance with abnormal operating procedures and plant chemistry procedures. As a result of the manual scram, PCIS groups 2, 3, and 4 isolations occurred when reactor water level dropped below 170 inches. All isolations went to completion. The reactor water level decrease is normal following a scram from 28% power due to void collapse in the reactor vessel. Reactor water level was subsequently restored to normal and the PCIS group isolations were reset.

Notifications were made under 10 CFR 50.72(b)(3)(iv)(A) and 50.72(b)(2)(iv)(B) on March 18, 2007 and are listed as event number 43247.

II. Assessment of Safety Consequences:

The function of the Condensate Demineralizer System is to remove soluble and particulate material from the condensate water in order to maintain required reactor water quality, including during minor condenser tube leakage. The system must also maintain condensate supply to the Feedwater System at required flow and pressure. The system does not have a safety-related function. However, the system is important to power production.

The resin intrusion of 3/18/07 caused a significant degradation of reactor water chemistry parameters, exceeding Action Level 3 values. In accordance with industry guidelines and plant procedures, the plant was promptly shut down and reactor water temperature was reduced to less than 200°F to minimize the impact on fuel, RPV internals, and plant components. Plant demineralizer systems were subsequently operated to restore reactor water chemistry.

A review of the event was completed prior to plant restart. This review determined that, based on internal and external Operating Experience, no detrimental effects on reactor materials or fuel are expected.

Therefore, the plant shutdown did not result in any radiological or nuclear concern which would impact the health and safety of the public.

This event did not result in a Safety System Functional Failure.

III. Cause of Event:

An investigation into this event was completed under Root Cause Evaluation (RCE) 1064.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 5
		2007	-- 006	-- 00	

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

Overall RCE Conclusions

It was concluded that keeping several F/D beds in HOLD after the Condensate System was secured during the first week of the refueling outage created opportunities for resin to enter the influent headers of the condensate filter demineralizers due to existing equipment deficiencies. Resin that had accumulated in the influent header was subsequently transferred into the effluent header as the Condensate System was placed in operation during plant startup. Resin that had accumulated in a dead leg section of effluent piping was subsequently passed forward into the reactor after Condensate F/D D was placed in service causing a chemistry excursion.

Root Causes

The RCE identified the following Root Causes (RC):

- RC 1: The design of pressure equalization valves SV1715A (B, C, D, E) and leakage through Condensate Demineralizer influent valves CV1718A (B, C, D, E) allow resin to leak out of the Condensate F/Ds and enter the condensate system.
- RC 2: Station procedures for operation of the Condensate and Condensate Demineralizer systems do not prevent consequences which are adverse to power production. Specifically, they do not provide clear direction to either secure and backwash F/Ds or operate them in FLOAT when the Condensate System is secured and do not ensure that all system piping is flushed prior to system restoration.

IV. Corrective Actions:

Immediate Actions to address the Condition

In response to the resin intrusion of 3/18/07, the plant was promptly shutdown and reactor water temperature was reduced to less than 200°F, in accordance with industry guidelines and plant procedures. Plant demineralizer systems were operated to restore reactor water chemistry.

A formal troubleshooting plan was implemented to investigate the cause of the resin intrusion. A review of the event was also completed prior to plant restart. This review determined that, based on internal and external Operating Experience, no detrimental effects on reactor materials or fuel are expected. Affected piping systems were flushed prior to power operation.

Corrective Actions to Prevent Recurrence (CATPRs)

CATPR 1-1

Establish a positive sealing method in both directions on the Pressure Equalizing Line for each Condensate F/D. This will require replacement with a different design, installation of check valves, or other action which accomplishes positive sealing.

LICENSEE EVENT REPORT (LER) **TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
Duane Arnold Energy Center	05000331	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 of 5
		2007	-- 006	-- 00	

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

CATPR 1-2

Rebuild operator and valve internals on each Condensate Demineralizer Influent and Effluent Control Valves (CV1718A (B, C, D, E) and CV1719 A (B, C, D, E)) to ensure that the required isolation function of these valves is maintained.

CATPR 2-1

Revise Operating Instruction (OI) 639 and OI 644 to provide clear direction that if a Condensate Demineralizer will not immediately be backwashed that it must be manually isolated and placed in FLOAT when the Condensate System is secured.

CATPR 2-2

Establish flushing criteria and methods for the Condensate, Feedwater, and Condensate Demineralizer Systems.

CATPR 2-3

Revise OI 639 to incorporate Condensate Demineralizer Effluent flushing criteria established in CATPR 2-2.

V. Additional Information:

Previous Similar Occurrences:

From LER review over the previous 10 years, the following two similar occurrences were identified in:

2003-001 - Punctured Main Condenser Tube Resulting in Rx Water Chemistry Excursion and Manual Rx Scram.

2003-005 - Unplanned Manual Reactor Scram due to High Reactor Coolant Conductivity.

EIIS System and Component Codes:

SF - Condensate Demineralizer System

Reporting Requirements:

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