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David B. Bice
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1CAN061001

June 09, 2010

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

Subject: Licensee Event Report 50-313/2010-003-00
Manual Reactor Scram
Arkansas Nuclear One – Unit 1
Docket No. 50-313
License No. DPR-51

Dear Sir or Madam:

Pursuant to the requirements of 10 CFR 50.73(a)(2)(iv)(A), enclosed is the subject Licensee Event Report concerning a manual Reactor scram on April 18, 2010.

There are no new commitments contained in this submittal.

Sincerely,

DBB/slc

Enclosure

cc: Mr. Elmo Collins
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

NRC Senior Resident Inspector
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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Arkansas Nuclear One, Unit 1	05000313	1 OF 4

4. TITLE Manual Reactor Scram Conservatively Initiated After Multiple Abnormal Events Occurred During Plant Startup From a Refueling Outage

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	18	2010	2010	003	00	06	09	2010	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

1

10. POWER LEVEL

011

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

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER- Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
David B. Bice, Acting Manager, Licensing	479-858-5338

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
B	AB	SEAL	B580	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ **YES** (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ **NO**

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

On April 18, 2010, Arkansas Nuclear One-Unit 1 (ANO-1) was operating at approximately 11 percent Reactor power, nearing the completion of the twenty-second refueling outage, and preparing to connect the Main Generator to the Electrical Grid (Grid). The ANO-1 Operating Staff entered the Reactor Coolant Pump Abnormal Operating Procedure at 1346 Central Daylight Time (CDT) due to indications of a degraded third stage seal on a Reactor Coolant Pump (P-32C). The cause of the P-32C seal failure was later determined to be an inadequate tolerance between the pump coupling slinger ring and stand pipe splash shield. At 1356 CDT, an Operator stationed at the Main Turbine reported smoke and small flames at Main Turbine Governor Valve 3 (GV3). An electro-hydraulic control (EHC) fluid leak that had previously been repaired during the outage resulted in EHC fluid entrainment in the calcium silicate piping insulation at GV3, promoting an exothermic reaction between the EHC fluid and the insulation when exposed to operating temperatures. The Operating Staff manually tripped the Main Turbine and conservatively performed a manual Reactor scram at 1357 CDT. A local CO2 fire extinguisher was used to extinguish the small flames at GV3 immediately following detection by the Operator stationed at the valve. MODE 5 conditions were established, and after repairs to the Main Turbine insulation and P-32C seal replacement, ANO-1 was connected to the Grid at 1918 CDT on April 25, 2010.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Arkansas Nuclear One – Unit 1	05000313	2010	- 003	- 00	2 OF 4

NARRATIVE

A. Plant Status

At the time of the event, Arkansas Nuclear One – Unit 1 (ANO-1) was nearing the completion of the twenty-second refueling outage (1R22), operating at approximately 11 percent Reactor power, and preparing to connect the Main Generator [TB][GEN] to the Electrical Grid (Grid). The Main Generator was at rated speed with the Generator Output Breakers [TB][BKR] open, and Main Generator Exciter voltage regulator [TL][RG] testing was in progress. All structures, systems, and components that were used, or could have been used to mitigate, reduce the consequences of, or limit the safety implications of the event were available.

B. Event Description

On April 18, 2010 at 1346 Central Daylight Time (CDT), the ANO-1 Operating Staff entered the Reactor Coolant Pump [AB][P] Abnormal Operating Procedure due to Control Room indications of a degraded third stage seal [SEAL] on a Reactor Coolant Pump (P-32C). The P-32C seal and rotating assembly had recently been replaced during 1R22. At 1356 CDT, an unrelated small fire was identified at Governor Valve 3 (GV3) [TA][V] in the High Pressure Main Turbine enclosure. Smoke and short flames were noted coming from an approximately 2-inch wide gap in the insulation surrounding GV3, and was immediately reported to the Control Room by an Operator stationed at that location. The Operating Staff manually tripped the Main Turbine and conservatively performed a manual Reactor scram at 1357 CDT. A local CO2 fire extinguisher was used to extinguish the small flames at GV3 immediately following detection. MODE 5 conditions were established, and after repairs to the Main Turbine insulation and P-32C seal replacement, ANO-1 was connected to the Electrical Grid at 1918 CDT on April 25, 2010.

C. Apparent Causes

The manual Reactor scram was conservatively performed by the ANO-1 Operating Staff due to the occurrence of multiple abnormal events. This conservative decision was considered appropriate by Arkansas Nuclear One (ANO) Plant Management.

During 1R22, major work was completed on P-32C. Upon reassembly of the pump and seal components, all identified dimensions were verified to be correct per vendor procedures. The clearance between the pump coupling slinger ring and the stand pipe splash shield was not measured and was not recognized by the vendor to be a critical dimension. After the pump was placed in service and pump shaft axial growth occurred due to normal thermal, mechanical, and deflection growth, the pump coupling slinger ring came into contact with the stand pipe splash shield, resulting in metal erosion from the stand pipe splash shield. The interaction between the slinger ring and splash shield created debris that ultimately entered the third stage of the P-32C pump seal, causing the third stage seal failure.

Apparent Causes – continued

The root cause of the P-32C seal failure was determined to be a lack of recognition that the gap between the pump coupling slinger ring and stand pipe splash shield was a critical dimension, and the lack of any documentation specifying the critical dimension value.

The small fire at GV3 resulted from a previously repaired electro-hydraulic control (EHC) [TG] fluid leak causing EHC fluid entrainment in the pipe insulation. The EHC contained in the calcium silicate insulation experienced an exothermic catalytic reaction. The fire hazard associated with EHC-soaked calcium silicate insulation was determined to be applicable to locations where an EHC leak could saturate calcium silicate insulation while at cold conditions, then be subjected to high temperatures above 450 degrees Fahrenheit, with a path for the low molecular weight volatile vapors to escape into open air. The small flames issuing from the insulation at GV3 were coming from a patched area of the pipe insulation where an air gap existed for this specific condition to occur.

D. Corrective Actions

The manual Reactor scram was a result of conservative decision-making on the part of the ANO-1 Operating Staff. No corrective actions were warranted as a result of that action.

The P-32C Flowserve (previously Byron-Jackson) N-9000 seal was removed and replaced with a rebuilt N-9000 seal. The pump coupling slinger ring to stand pipe splash shield gap tolerance was identified and corrected during the seal replacement.

The EHC-contaminated insulation was removed from GV3 and replaced. Additionally, an ANO-1 plant walk down was performed by Fire Protection Engineering and Operations to identify potential areas for lube oil [LL] or EHC leaks, where such a leak could come into contact with hot pipes or equipment. The walk down focused on the High Pressure Turbine governor and throttle valves (and gland steam deck below), the Low Pressure and High Pressure Turbine bearings and associated lube oil piping [TD], the Main Feed Water [SJ] Pumps [P], and the Main Feed Water Pump Lube Oil Reservoirs [SL]. Any identified issues were documented in the ANO Corrective Action Process. External Industry Operating Experience Report OE31287 was developed and issued.

E. Safety Significance Evaluation

Systems and components required to shutdown the Reactor, maintain safe shutdown conditions, remove residual heat, and control the release of radioactive material were available and performed as required. Following the manual Reactor scram initiation, all Control Rods [AA] fully inserted. No Primary or Secondary Safeties lifted and no safety limits were exceeded. The small flames at Main Turbine GV3 were immediately extinguished by an Operator stationed at the GV3 location, and did not pose a safety concern.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Arkansas Nuclear One – Unit 1	05000313	2010	- 003 -	00	4 OF 4

Safety Significance Evaluation - continued

ANO-1 operating procedures require a Reactor Coolant Pump to be secured if two of the pump seal stages were to fail. The condition that caused the failure of the third stage of the P-32C pump seal did not impact the ability of the first two stages of the seal to function properly. The remaining intact seal stages on the Flowserve (previously Byron-Jackson) N-9000 Reactor Coolant Pump Seal are designed to maintain Reactor Coolant System (RCS) integrity for this event. There is no significant safety concern associated with the failure of one stage of the P-32C mechanical pump seal.

F. Basis for Reportability

A 4-hour Non-Emergency notification was performed in accordance with 10CFR 50.72(b)(2)(iv)(B) Reactor Protection System [JC] Actuation.

Follow up reporting is required by 10CFR 50.73(a)(2)(iv)(A) “Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B).”

G. Additional Information

A review of the last five years of reportable events did not reveal any events that would be considered similar.

Energy Industry Identification System (EIIS) codes and component codes are identified in the text as [XX].