NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

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EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 3	05000 287	1 OF 8

TITLE (4)
Packing Leak Due To Inappropriate Action Results In Unit Shutdown

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
07	18	95	95	-- 01 --	00	08	17	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	0

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

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER
20.405(a)(1)(iii)	X 50.73(a)(2)(i) (A)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Lanny V. Wilkie, Safety Review Manager	(803) 885-3518

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
A	AB	V	R342	Y						

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	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 July 18, 1995, Oconee Unit 3 was at hot shutdown (2150 Psig, 532F) preparing to begin Zero Power Physics Testing at the end of a refueling outage. 3RC-3 (Pressurizer Spray Block Valve) was cycled at approximately 0550 hours. At approximately 0603 hours the Operator At The Controls noticed that the Letdown Storage Tank level was indicating a Reactor Coolant System (RCS) leak, estimated to be 36 gpm. 3RC-3 was closed, reducing the leak to 7 gpm. An Unusual Event was declared and Operations initiated a cooldown due to high RCS leakage, per Technical Specifications. The Unusual Event was terminated at 2243 hours when the unit reached cold shutdown. A packing leak on 3RC-3 was repaired. The root cause was inappropriate action, lack of attention to detail, by personnel who repacked 3RC-3 during the refueling outage.

BACKGROUND

The Pressurizer (PZR) [EIIS:PZR] is used to control Reactor Coolant System (RCS) [EIIS:AB] pressure. 3RC-1 is the normal pressurizer spray valve [EIIS:V] and 3RC-3 is a block valve down stream of 3RC-1. Because 3RC-3 is the last valve in this flow path, it cannot be isolated from the steam space in the PZR.

3RC-3 is a 2 1/2 inch Rockwell model 3628F316JM valve with a Limitorque electrical motor operator. It has a "rising/rotating" stem design which tends to put rotational stress on packing.

Technical Specification (TS) 3.1.6 addresses RCS leakage. TS 3.1.6.1 requires unit shutdown if total RCS leakage exceeds 10 GPM. TS 3.1.6.2 requires unit shutdown if unidentified RCS leakage exceeds 1 gpm. TS 3.1.6.3 requires unit shutdown if any leakage exists through a non-isolable fault in a RCS strength boundary.

EVENT DESCRIPTION

On July 18, 1995, Oconee Unit 3 was at hot shutdown (2150 Psig, 532F) preparing to begin Zero Power Physics Testing (ZPPT) at the end of a refueling outage.

At 0540 hours, the Operator At The Controls (OATC) began to configure the pressurizer spray line, in accordance with the ZPPT procedure, for continuous spray to enhance mixing between the Reactor Coolant System (RCS) and the Pressurizer (PZR) for Boron control during ZPPT. This required turning on the PZR heaters, opening 3RC-1 (PZR Normal Spray Control Valve), and throttling 3RC-3 (PZR Normal Spray Block Valve) to maintain steady RCS pressure.

3RC-3 was initially full open, but was throttled shut in response to the expected decrease in RCS pressure when 3RC-1 was opened. At approximately 0550 hours, 3RC-3 was throttled open and pressure stabilized. At approximately 0603 hours the OATC noticed that the Letdown Storage Tank (LDST) level chart recorder was indicating a significant continuing decrease in LDST level. The Reactor Building Normal Sump [EIIS:WD] Level showed a corresponding level increase. The Operators entered

Abnormal Procedure AP/3/A/1700/02, "Excessive RCS Leakage." At 0605 hours, the control room personnel estimated the leak rate to be approximately 36 gpm.

The Control Room Senior Reactor Operator suspected that the valve packing on 3RC-3 had failed when the valve was operated and gave instructions to the OATC to isolate the PZR spray line. At approximately 0607 hours the OATC attempted to close 3RC-1, but it would not respond. 3RC-3 was closed and a Non-Licensed Operator was dispatched to check the 3RC-1 breaker.

Another operator used the RB video camera to scan the RB and noted a steam cloud rising from the steam generator cavity that contains the PZR.

At 0611 hours, the 3RC-1 breaker was reset and 3RC-1 was closed. (Later investigation revealed that a bad conduit seal allowed leakage from 3RC-3 to enter the 3RC-1 Limitorque operator and wet the terminal strip. This grounded the circuit momentarily and caused the breaker to trip.) Closing 3RC-1 isolated 3RC-3 from the water source so that only steam from the PZR steam space could challenge the leak. RCS leakage was then calculated to be about 7 gpm. The Operations personnel and the Shift Technical Advisor discussed the situation, concluded that conditions met the Technical Specification 3.1.6 criteria for initiating a unit cooldown, and did so. At approximately 0633 hours the Operators secured one reactor coolant pump in each loop to facilitate the cooldown.

Operations shift management also reviewed the requirements of the site emergency plan and declared an Unusual Event at 0652 hours. Agencies specified in the site emergency plan were notified between 0706 and 0730 hours.

The Unusual Event was terminated at 2243 hours when the unit reached cold shutdown. It was confirmed that the leak was due to a packing failure on 3RC-3.

A failure investigation team was formed to investigate the cause of the packing failure. Because Component Engineering was aware that 3RC-3 had been repacked this outage using ARGO brand engineered packing, ARGO was consulted and a technical

representative (Tech Rep A) arrived on-site at approximately 2100 hours to assist in the troubleshooting inspection of the valve.

At 1100 hours on July 19, Duke personnel, including Component Engineer A, entered the Reactor Building to perform a visual inspection of the valve prior to cleaning and decontamination of the boron residue in the vicinity of the valve. These personnel noted that the packing gland follower was cocked. Specifically, on one gland stud, about one or two threads of the stud extended above the nut, while noticeably more threads of the other stud showed above its nut.

During the evening shift of July 19, after cooldown and draining of the RCS below the elevation of 3RC-3, and after the area had been cleaned and decontaminated, ARGO Tech Rep A and Duke maintenance mechanics removed the valve operator and continued the inspection of the packing.

While inspecting the stuffing box. a piece of old packing material approximately one half inch long and approximately one fourth inch high was found at the bottom of the stuffing box on the outside circumference by Tech Rep A. It was found on the same side of the stem as the high side of the cocked gland follower. This location is on the far side of the valve from the side accessible to a technician if the valve operator is in place.

Following the troubleshooting inspection, the valve was repacked and reassembled. This time an ARGO flexible braided packing was used. The unit start-up was resumed.

The investigation included a review of the outage work activity to repack 3RC-3, which is described below:

On June 7, 1995, during Unit 3 shutdown for the refueling outage, operations personnel identified that 3RC-3 had a packing leak and initiated a Work Request.

On June 27, Duke Power Electric System Support Division personnel (Maintenance Mechanics A and B) removed the old packing and determined that the valve stem was 1.008 inch in diameter rather than the 1.125 inch expected. Due to material availability, it was decided to have ARGO manufacture packing rings sized for the actual stem size and use 1.125 inch SEALCO brand bushings already on hand.

ARGO Tech Rep B, who was providing on-site support during the outage, installed the packing on July 2, assisted by Maintenance Mechanics A and C. Mechanic A and Tech Rep B both stated that they inspected the stuffing box visually and with probes prior to installing the new packing to assure that the old packing had been removed. After the packing had been torqued, Tech Rep B stated that he measured distances from the valve bonnet to the follower as a check for gland cocking and did not note any discrepancy. Maintenance Mechanic A also stated that he looked for, but did not observe, any sign that the gland follower was cocked.

3RC-3 was left in the open position. On July 16 the unit was heated up and pressurized. A system "mini-hydro" was subsequently performed, which subjected the valve to approximately 2200 psig, with no leakage observed. System pressure was maintained at normal operating pressure of 2155 psig until the leak started on July 18.

A total of forty one valves were packed with ARGO packing during this refueling outage. Of these, 27 were repacked in the field by Tech Rep B. The valves repacked using ARGO packing this outage were visually inspected. Two (3MS-35 and 3MS-82) were found to have cocked gland followers and to have packing leaks. ARGO Tech Rep B stated that these valves were among those he had repacked. The gland nuts were tightened on each of these valves to even up the gland followers. In both cases, this slowed but did not stop the leak. It is expected that these valves will be repacked during the next refueling outage.

CONCLUSIONS

The troubleshooting team concluded that the immediate cause of the packing failure was the presence of a piece of old packing at the bottom of the stuffing box. The old packing caused the new ARGO packing to stack up in a cocked configuration. This held pressure until the valve was stroked under pressure, at which point the cocked packing straightened, which relieved the load and allowed the packing to fail.

The piece of old packing remained in place due to the failure of both Maintenance Mechanic A and Tech Rep B to observe it. Based on discussion with the personnel involved and others who perform this activity, it appears that reasonable effort had

been made to find and remove all pieces of old packing. Tech Rep A stated that he found the piece only because he was troubleshooting a known leaker. It required several attempts and he might have quit inspecting before finding it if he had been on a routine job.

The final positions of the gland nuts and gland follower were more easily observable. Discussion with the individuals after the event indicates that both were sufficiently trained to be aware of the importance of a cocked gland and appropriate methods of detection. Both personnel stated that they specifically observed for indications that the gland might be cocked, as part of the repack performed on July 2, 1995. However, upon entry after the leak, investigators found that the un-equal position of the nuts on the gland studs was immediately apparent. It is concluded that Maintenance Mechanic A and Tech Rep B did not perform their observations with sufficient attention to detail to detect that the gland was actually cocked.

The use of the 1.125 inch bushings (for the larger size valve stem) was questioned. It was recognized that the 1.125 inch bushings would leave a larger gap between the OD of the stem and the ID of the bushing. Tech Rep A stated that, by itself, this might cause a slow leak after a long term (e.g. one to two years), but would not be expected to result in a total packing failure as was seen in this event. Therefore, it is concluded that the use of these bushings was not a root cause of this event.

This packing leak is reportable under NPRDS. It is reported against 3RC-3, a 2 1/2 inch Rockwell model 3628F316JM valve.

There were no personnel injuries, releases of radioactive materials, or personnel radiation overexposures associated with this event.

On June 30, 1993, Oconee Unit 2 experienced an excessive Reactor Coolant System (RCS) leak due to a packing leak on 2HP-64 (reported to the NRC as a special report 8-5-93, revised 02-02-94). In that event, the leak was isolated, therefore, no unit shutdown occurred. One root cause of that event involved lack of management policy to control torque used to tighten packing. In this event, the required torque

was specified but personnel did not observe indications that a problem existed. Therefore, this event is considered non-recurring.

Duke Power has been informed of two valves at Arkansas Nuclear One which failed such that the ARGO packing was blown out. It is Duke's understanding that these failures are still under investigation and that the root cause of those failures have not yet been determined. A review of industry operating experience data did not reveal any additional applicable prior events.

CORRECTIVE ACTIONS

Immediate

1. Operations personnel closed 3RC-3 to reduce leakage and began unit cooldown.

2. The breaker for 3RC-1 was reset and 3RC-1 was closed.

Subsequent

1. After the unit was cooled down and depressurized, the problem was investigated and 3RC-3 was repacked.

2. The 3RC-1 circuit was checked, some terminations were remade at the valve operator terminal strip, and the conduit connector at the operator was resealed.

3. Other valves repacked during the outage using ARGO packing were visually inspected.

Planned

1. 3MS-35 and 3MS-82 will be repacked at the next appropriate outage.

2. Evaluate methods and equipment for possible enhancements to aid inspections of stuffing boxes (and/or other components with limited accessibility).

3. Procedures for repacking valves will be reviewed and enhanced where desirable to better address a) checks for cocked gland followers and/or b) other indications of quality workmanship when repacking valves.

SAFETY ANALYSIS

The initial 36 gpm Reactor Coolant System (RCS) leak was in excess of Technical Specification limits but was well within the capacity of the High Pressure Injection (HPI) [EIIS:CB] make-up system. The leak was diagnosed and partially isolated promptly to limit the leakage to about 7 gpm. All trains of HPI were available as well as several sources of make-up water. The normal sump and emergency sump paths were available for recovery and recirculation of the leaking water had it become necessary. Multiple additional failures would have had to occur to challenge core integrity. Therefore, the probability of extensive loss of RCS inventory leading to core uncovery and/or core damage was extremely small.

The health and safety of the public was not affected by this event.