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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Units 1 and 2
Docket No. 50-313/368
License No. DPR-51/NPF-6
Licensee Event Report 50-313/96-008-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(ii)(B), enclosed is the subject report concerning the capability for maintaining inventory in the Emergency Cooling Pond.

Very truly yours,

Dwight C. Mims

Dwight C. Mims
Director, Nuclear Safety

DCM/dc

enclosure

290059

IE22 1/1

cc: Mr. Leonard J. Callan
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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One - Unit 1	05000313	1 OF 5

TITLE (4) Sluice Gate Leakage Resulted in the Inability to Maintain Emergency Cooling Pond Inventory for Thirty Days Following a Design Basis Accident Without Additional Action

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
09	22	96	96	008	00	10	22	96	Arkansas Nuclear One-Unit 2	05000368
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N/1	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)	70.71(b)
POWER LEVEL (10)	0/98	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)	70.71(c)
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)	OTHER
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	Specify in
		20.405(a)(1)(iv)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)	Abstract Below
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)	and in Text

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Dee Cantwell, Nuclear Safety and Licensing Specialist	501-858-5589

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
X	BI	ISV	A480	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 September 22, 1996, during a refueling outage, ANO-1 surveillance testing discovered leakage from a sluice gate of 103.1 gallons per minute (gpm). This leakage was in excess of the maximum allowable sluice gate leakage from the five gates (two ANO-1 gates and three ANO-2 gates) that isolate Dardanelle Reservoir from the Service Water (SW) bays. Leakage was determined to be due to a zebra mussel infestation of the Circulating Water (CW) bays that prevented the sluice gate from sealing properly at the bottom. A report was made to the NRC Operations Center at 1156 on September 22, 1996. Subsequently, a second sluice gate was found to exhibit a leakage rate of 41 gpm. ANO-1 CW bays, SW bays, and sluice gates were cleaned and the sluice gates were adjusted prior to the respective SW system loops being returned to service.

ANO-2 forebays and SW bays were inspected and cleaned. The inspection revealed that all three sluice gates' seal areas and guides were in good condition and free of debris and zebra mussels that would have prevented them from sealing.

The CW bays, forebays, SW bays, and Intake Canal area will be inspected and cleaned on a more frequent schedule until a program to control zebra mussel infestations can be implemented.

A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One Unit 1 (ANO-1) was in cold shutdown during Refueling Outage 1R13. ANO-2 was operating at approximately 98 percent power in steady state condition.

B. Event Description

On September 22, 1996, during an inspection of the ANO-1 Circulating Water (CW)[KE] bays, sluice gate SG-1 was electrically closed and the "B" CW bay was drained. A surveillance leakage test on SG-1, located between the "B" CW bay and the "A" Service Water (SW)[BI] bay (see attachment), demonstrated an as-found leakage rate of 103.1 gallons per minute (gpm). This leakage was in excess of the maximum allowable total sluice gate leakage from the five lake side sluice gates (two ANO-1 gates and three ANO-2 gates) that isolate the Dardanelle Reservoir from the SW bays as described in the ANO-2 Safety Analysis Report (SAR). The ECP supply sluice gates, SG-5 and SG-7, were leak tested to verify the ability of the gates to isolate their respective bay from the ECP to stop the loss of inventory.

At ANO-1, the SW system receives cooling water from Dardanelle Reservoir (lake) and supplies it to cool miscellaneous heat exchangers and cooling components in two loops. The system consists of an Intake Structure [MD] and its associated equipment, a 14 acre Emergency Cooling Pond (ECP)[BS] as a backup supply of cooling water, a series of sluice gates which direct the supply of water from the Intake Canal or ECP, three full-flow SW pumps, a discharge flume, and various system loads. During normal operation, SW is pumped from the lake, through the system loads, and into a return header common to both loops. The ECP serves as a heat sink for simultaneously shutting down both units in the unlikely event of a loss of inventory in the lake caused by a condition such as a failure of the dam. The ECP is sized to contain sufficient water for dissipating the total combined heat transferred to the SW systems of both units with a postulated Design Basis Accident (DBA) Loss Of Coolant Accident (LOCA) in one unit and a simultaneous shutdown of the other unit. The ECP is designed to accommodate evaporative losses while maintaining sufficient inventory to provide cooling for both units in order to maintain temperatures below acceptable limits for at least 30 days without makeup.

An inspection of the condition of SG-1 on the CW bay side revealed that it was covered with zebra mussels. SG-1 was left closed and the "A" SW bay was pumped down to maintain any debris trapped under the gate. Prior to opening the gate, clusters of zebra mussels could be seen under the gate. The gate was between 1/16 and 1/8 inch above the seal. When the gate was opened and the rubber seal surface was examined, indented areas were found on the right and left ends. The material under the gate seal was loose and easily removed. In addition, the bottom of the gate was found to have a 1½ inch long

indentation located three inches from the left side. The epoxy coating on the bottom of the gate was missing from this area.

On October 1, 1996, after returning the "A" and "B" SW bays to service, the "C" CW bay was drained. The as-found condition of sluice gate SG-2, located between the "C" CW bay and the "C" SW bay, was similar to that observed on SG-1. It was determined that SG-2 exhibited a leakage rate of 41 gpm.

The SW bay walls and sluice gates SG-3 through SG-7 were clean of zebra mussels except within alcove area to SG-1 in the "A" bay and SG-2 in the "B" bay. The SW bay floors, however, had accumulations of silt and mussel shells.

C. Root Cause

The root cause of the excessive leakage from SG-1 and SG-2 was determined to be due to zebra mussel infestation of the CW bays. The mussel shells prevented the gates from sealing properly at the bottom.

Routine environmental sampling of Dardanelle Reservoir had identified the presence of zebra mussels as well as an increase in population density. However, a population increase of the magnitude identified in the CW bays was not anticipated.

D. Corrective Actions

The seats of both SG-1 and SG-2 were repaired, the rubber seals were replaced, and all exposed surfaces were cleaned. The ANO-1 CW bays and SW bays were cleaned, as well as the area between the bar grates and stop logs on the "B" and "C" CW bays. Both sluice gates SG-1 and SG-2 were adjusted and the torque and limit switches were reset. The as-left leakage rates were 2.4 gpm and 3.25 gpm on SG-1 and SG-2 respectively.

ANO-2 forebays and SW bays were inspected and cleaned by divers. The inspection revealed that all three sluice gates' seal areas and guides were in good condition and free of debris and zebra mussels that would have prevented them from sealing. The alcove areas for the inlets to the SW bays were found to have no zebra mussels attached to the walls and very minor silt accumulation in the area.

Currently, treatment of SW at ANO consists of continuous sodium hypochlorite application or a combination of sodium hypochlorite and sodium bromide injection except during system outages. Previous inspections of the SW bays on both units have verified sufficient chemical treatment to control both microfouling and macrofouling. Application of biocide to the CW bays is restricted by environmental permit to no more than two hours per day.

ANO-1 and ANO-2 SW systems are monitored using flow-through bioboxes and component visual inspections. No zebra mussels have been detected in the bioboxes and only a small number of dead zebra mussel shells have been found in component inspections.

Other methods to prevent the development of significant zebra mussel infestations on the sluice gates, in the alcove areas, and in the forebay areas providing lake supply to the SW systems of both units will be developed, and implemented to the extent possible, by February 28, 1997.

Inspections and cleaning of the CW bays, forebays, SW bays, and Intake Canal area will be performed on a more frequent schedule as an interim measure until a program to control zebra mussel infestations can be implemented.

E. Safety Significance

Regulatory Guide 1.27, Revision 1, specifies that the ECP is required to provide a thirty day supply of cooling water to permit the simultaneous safe shutdown and cooldown of all nuclear units that it serves and to maintain them in a safe shutdown condition. It also specifies analytical requirements with regard to inventory. The analysis uses meteorological data corresponding to the thirty day period of the worst case low humidity concurrent with the highest wind speeds recorded during the same time period. The wind speed criterion was applied by taking the highest daily average wind speed noted during the thirty day period and assuming it to be constant over the entire time frame. No rainfall is credited during the post-event period. The meteorological data are combined with the worst case heat load to calculate the total inventory demand due to evaporation. The evaporative loss alone, combined with the condensate demand for the safe shutdown unit (the heat is either ultimately rejected to the ECP via SW or to the atmosphere via steam generators), represents approximately 67 percent of the inventory demand on the ECP. The remaining demand is distributed among sluice gate leakage, SW boundary valve leakage, Spent Fuel Pool [DA] boil-off, fill of SW pump bays during suction transfer, fire fighting, and seepage through the ECP clay liner. No credit was taken for any action to fill the ECP. The conservative nature of the assumptions used ensure that the actual inventory requirements would have been less than those indicated by the analysis.

ECP inventory loss would have been detected and compensated for if a loss of lake event were to have occurred with SG-1 leaking. Daily surveillance of ECP inventory, required by Technical Specifications, would have identified the condition. In addition, procedures are in place requiring visual verification of sluice gate seal integrity in the event of loss of Dardanelle Reservoir. Inventory would have been decreasing at a rate that would have allowed compensatory measures to provide makeup from off-site sources, devise a means to stop the leak, or contain the leakage in a manner such that it could be returned to the ECP via temporary pumps. It is noted that probabilistic safety assessment methods generally assess plant transients or conditions for a time frame of 24 hours following the initiating event. This time frame

has become standard since adequate resources may be assembled during this time to mitigate the consequences of a variety of plant conditions.

The total as-found sluice gate leakage for SG-1 and SG-2 was 144.1 gpm. The addition of the ANO-2 as-left sluice gate leakage of 0.27 gpm and boundary valves leakage of 2.57 gpm and the ANO-1 as-found boundary valve leakage of 9.69 gpm resulted in a total leakage rate of 156.63 gpm. The ECP inventory analysis of record defines 89 gpm of leakage from the ECP over the required availability period of 30 days following the loss of lake event. The analysis assumes a boundary valve leakage of 39 gpm and a sluice gate leakage of 50 gpm. The as-found sluice gate leakage on SG-1 and SG-2, while higher than the analyzed leakage for these inventory demands, is not considered to affect past operability due to the fact that this leak is isolable by closing either the "A" or "C" pond side sluice gates. The past operability for this condition is, however, contingent upon having enough time to locate the various ECP inventory demands and take appropriate corrective actions. A conservative analysis was performed which concluded that operators have several days following the event to make this assessment and perform the actions. These actions would ensure the required thirty day availability. A test performed on SG-2, where operator action reduced the leak rate from 41 gpm to 7 gpm, demonstrated that the fouled gate could be flushed and adequately sealed. Comparable results would most probably be achieved on SG-1 with similar actions.

F. Basis for Reportability

Although the past operability evaluation of this condition concluded that the ECP remained operable based on reasonable operator actions, the potential did exist for the condition to render the ECP inoperable during the applicable DBA. Therefore, it is conservatively classified as a condition outside the design basis of the plant and is being reported in accordance with 10CFR50.73(a)(2)(ii)(B).

G. Additional Information

An event was reported in Licensee Event Report 88-017-00, letter 1CAN018903 dated February 10, 1989, with some similarity to this condition, in that an ANO-2 sluice gate was found to be leaking at approximately 325 gpm. The events differ in that the excessive leakage was due to out of adjustment gate seating surfaces and loosening of the gate's frame-to-wall mounting bolts.

SG-1 and SG-2 are ARMCO 36" x 36" sluice gates, operated by Limitorque SMB-0 actuators equipped with 15 FT-LB motors and 69.56 Overall Actuator Ratios.

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

General Layout of ANO-1 Service Water and Circulating Water Intake Structures