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U. S. Nuclear Regulatory Commission
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SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/89-029-01

Gentlemen:

Enclosed is a supplemental report concerning operation of the Service Water System in an unacceptable configuration. This supplement is being submitted to document modification of a corrective action commitment.

Very truly yours,

James J. Fisicaro

James J. Fisicaro
Director, Licensing

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NRC Form 366
(6-89)

U.S. Nuclear Regulatory Commission
Approved OMB No. 3150-0104
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LICENSEE EVENT REPORT (LER)

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TITLE (4) Personnel Error Results in Operation of the Service Water System in a Configuration in Which a Single Component Failure Could Render the System Inoperable During Emergency Operating Conditions

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 Names	Docket Number(s)
										0 5 0 0 0
0 8	2 5	8 9	8 9	-- 0 2 9	-- 0 1	0 2	2 6	9 3		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)							
POWER LEVEL (10)		__	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 (Specify in Abstract below and in Text, NRC Form 366A)
		__	20.405(a)(1)(iii)	X	50.73(a)(2)(i)	__	50.73(a)(2)(viii)(A)		
		__	20.405(a)(1)(iv)	X	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
Richard H. Scheide, Nuclear Safety and Licensing Specialist	Area Code 5 0 1 9 6 4 - 5 0 0 0

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	

SUPPLEMENT 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 fifteen single-space typewritten lines) (16)

On August 25, 1989, Plant Engineering personnel determined that the Service Water System (SW) operating procedure allowed operation of the system in a configuration that, under certain conditions, could result in the system being rendered inoperable by a single component failure. The procedure provided for normal operation of the system with two SW pumps in service and all of the loop crosstie valves open. If an Engineered Safeguards (ES) actuation were to occur concurrent with a loss of offsite power while pump P4A (Loop 1) was out of service and P4B (aligned to "red" ES power) and P4C ("green" ES power) were supplying SW and Auxiliary Cooling System loads, a failure of the "green" Emergency Diesel Generator to start would initially result in only one pump (P4B) remaining in service supplying both loops of SW and the ACW loads. Since one SW pump is not capable of supplying adequate flow to both SW loops and ACW, the system would be inoperable. Originally, the SW operating procedure called for the crosstie valves to be closed. However, it was common practice to operate with them open to allow running three SW pumps during hot weather. In 1980, the procedure was revised to reflect this practice. The cause of this condition was personnel error in that plant personnel failed to adequately evaluate the potential consequences of operating with the crosstie valves open. The SW system procedure was changed to require proper alignment of the loop crosstie valves.

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

A. Plant Status

At the time of discovery of this condition, Arkansas Nuclear One, Unit 1 (ANO-1) was operating at approximately 74 percent of rated power.

B. Event Description

On August 25, 1989, while reviewing the operating procedure for the Service Water System (SW) [BI], Plant Engineering personnel determined that the procedure allowed operation of the SW system in a configuration such that a single failure of an Emergency Diesel Generator (EDG) [EK] concurrent with a loss of offsite power and an Engineered Safeguards (ES) actuation could render the system inoperable.

The SW system consists of two independent, but interconnected, flowpaths which furnish cooling water to two independent trains of ES equipment under normal and emergency conditions. The system contains three 100 percent capacity pumps which are powered from the vital ES electrical buses. The Loop 1 pump (P4A) is powered from the "red" ES bus and the Loop 2 pump (P4C) is powered from the "green" ES bus. P4B is a swing pump which can be selectively powered from either ES bus and can be aligned to either SW loop via the loop crosstie isolation valves (see attachment). The Auxiliary Cooling Water system (ACW), a subsystem of the SW system which supplies non-essential loads, is connected to the SW crosstie line. The ACW isolation valve is a motor operated valve (MOV) which can also be selectively powered from either ES bus. The crosstie isolation MOVs are interlocked with the ES channel such that, upon an ES actuation, the two running SW pumps continue to operate and the crosstie valves position automatically to isolate the loops from each other. The ACW isolation valve automatically closes upon an ES actuation.

The "Service Water and Auxiliary Cooling System" operating procedure provided for normal operation of the SW system with two SW pumps in operation, powered from separate ES busses, with all of the loop crosstie valves and the ACW isolation valve open. Operating the system in this configuration creates the possibility for a single component failure to render the SW system incapable of supplying adequate cooling water flow during emergency operation. For example, if an ES actuation were to occur concurrent with a loss of offsite power while pump P4A (Loop 1) was out of service and P4B (aligned to "red" ES power) and P4C ("green" ES power) were supplying SW and ACW loads, a failure of the "green" EDG to start would result in only one pump (P4B) remaining in service supplying both loops of SW and ACW. The Loop 1 crosstie valves, which are powered from the "red" ES bus, would remain open since P4B would be aligned to that loop. P4C would not restart and the Loop 2 crosstie valves would not close since the "green" ES bus would be deenergized. Additionally, the ACW isolation valve would initially remain open since it is normally powered from the "green" ES bus. This condition would result in inadequate SW flow and could render the

system incapable of performing its design function until corrective actions were taken. Immediate corrective actions were taken to change the appropriate procedures to ensure that loop isolation would be accomplished if an ES actuation were to occur.

C. Safety Significance

Although the SW system might initially be unable to supply adequate flow if the event discussed above were to occur, corrective actions could be taken quickly to establish the proper valve alignment and adequate cooling flow. The ANO-1 Emergency Operating Procedure (EOP) requires prompt verification of the proper response of components and systems to an ES actuation. Since the valve position indications for the ACW isolation valve and the loop crosstie valves are included in this verification, their misposition would be quickly identified and could be corrected by manual valve operation. Additionally, the first contingency action of the "Degraded Power" tab of the EOP directs that the motor control cubicle which supplies power to the ACW isolation valve be verified to be aligned to an energized ES bus. This step ensures the prompt restoration of power to the valve which would then close automatically, if an ES signal were present, to isolate the ACW system. The impact on Loop 1 of the SW system would be further reduced since the major ES components on Loop 2 would not be in service due to the loss of power to the "green" ES bus. Additionally, inadequate long term cooling would be brought to the operator's attention by Control Room annunciation of component high temperature conditions. Although this condition is considered to be safety significant, it's significance is reduced by the availability of the procedural guidance and indications and annunciations mentioned above.

D. Root Cause

The "Service Water and Auxiliary Cooling System" operating procedure (Revision 0) provided for aligning the SW system for normal operation with at least two of the loop crosstie valves closed. However, due to increased cooling requirements during hot weather, it was common practice to operate with the loops crossconnected to allow running all three SW pumps. In 1980, after operating with the system in this configuration for several years, the SW system operating procedure was revised to reflect that the loop crosstie valves were normally open.

The root cause of this condition was personnel error. Plant personnel failed to properly evaluate the potential consequences of operating the SW system with the loop crosstie valves open at the time the decision was made to do so. Apparently, it was not recognized that simply changing the normal operating position of the valves would compromise the single failure design criterion of the system.

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A contributing factor to the duration of this condition was the inadequate 10CFR50.59 review process which was in place at the time the SW system operating procedure was revised (1980) to specify that the crosstie valves were normally open.

E. Basis for Reportability

Since operating the SW system with the loop crosstie valves open compromised the single failure criterion of the system and created the possibility that, had the event postulated above occurred, ES systems necessary to mitigate the consequences of an accident may have been prevented from performing their safety functions, this condition is reportable pursuant to 10CFR50.73(a)(2)(B) and 10CFR50.73(a)(2)(v). Technical Specification 3.3.1.C stipulates that whenever containment integrity is required that two SW pumps shall be operable to provide redundant and independent flowpaths. Since operating in the configuration discussed above resulted in the potential for a single failure to render both loops of the SW system inoperable, this condition is also reportable under 10CFR50.73(a)(2)(i)(B) as operation in a condition prohibited by the plant's Technical Specifications.

This condition was also reported in accordance with 10CFR50.72 via the Emergency Notification System on August 25, 1989, at 2015.

F. Corrective Actions

The applicable plant procedures were changed to require that the appropriate SW system loop crosstie valves are closed in the various operating pump combinations.

Initially, a procedure revision was also implemented which required that the motor control cubicle which supplies power to the ACW isolation valve be selected to the same ES bus as the swing SW pump whenever it is in operation. However, subsequent evaluation has concluded that this action is not necessary to ensure the operability of the SW systems during the postulated event. The initial actions required by the "Degraded Power" tab of the EOP ensures that power would be expeditiously returned to the ACW isolation valve, allowing it to automatically close. Additionally, the NRC Safety Evaluation of Chapter 9 of the ANO-1 Safety Analysis Report acknowledges that operator action is an acceptable method of isolating non-essential cooling systems during accident conditions.

Therefore, ANO has revised the appropriate procedure to no longer require that the motor control cubicle which supplies power to the ACW isolation valve be selected to the same ES bus as the swing SW pump.

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This change of commitment was discussed with NRC Region IV and Headquarters personnel during a telephone conversation on January 27, 1993.

The administrative controls which are in place at the present time are considered adequate to prevent the occurrence of events similar to the one discussed above. A procedure revision, which requires a 10CFR50.59 review, would be required prior to modifying a system operating configuration. The 10CFR50.59 process in place at the present time is much more in-depth and requires documented reviews of licensing basis documents when making procedure changes. In addition, the personnel who perform these reviews have received formalized training with respect to the process.

G. Additional Information

There have been no previous similar events reported in which a personnel error resulted in operation of a system in a configuration that could have rendered it inoperable during emergency operating conditions.

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

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ATTACHMENT