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 AUTH.NAME AUTHOR AFFILIATION
 NALEPKA,D.S. Wisconsin Public Service Corp.
 STEINHARDT,C.R. Wisconsin Public Service Corp.
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 88-011-00:on 880831,failure to recognize inoperable AFW
 pump during plant heatup.

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Kewaunee Nuclear Power Plant										DOCKET NUMBER (2) 0 5 0 0 0 3 0 5										PAGE (3) 1 OF 0 6																																	
TITLE (4) Failure to Recognize an Inoperable AFW Pump During Plant Heatup Results in the Plant Being in a Condition Prohibited by Technical Specification.																																																					
EVENT DATE (5) 0 8 3 1 8 8						LER NUMBER (6) 0 1 1 - 0 0 0 9 3 0 8 8						REPORT DATE (7) 0 8 3 0 8 8						OTHER FACILITIES INVOLVED (8) NA																																			
MONTH			DAY			YEAR			YEAR			SEQUENTIAL NUMBER			REVISION NUMBER			MONTH			DAY			YEAR			FACILITY NAMES						DOCKET NUMBER(S)																				
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POWER LEVEL (18) 0 0 0						20.402(b)						20.408(a)						20.73(a)(2)(iv)						73.71(b)																													
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LICENSEE CONTACT FOR THIS LER (12) David S. Nalepka - Plant Licensing Supervisor																						TELEPHONE NUMBER 4 1 4 3 1 8 1 - 2 1 5 1 6 0																															
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																					
CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NRC		CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NRC																																			
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On August 31, 1988 with a plant heatup in progress in preparation for a return to power following a mid-cycle shutdown, the reactor coolant system was heated to above 350°F with the turbine driven auxiliary feedwater (AFW) pump inoperable. Technical specifications require that three AFW pumps be operable prior to exceeding 350°F. The inoperability of one of the three AFW pumps resulted in the plant being in a condition prohibited by plant technical specifications and is reportable in accordance with 10CFR50.73 (a)(2)(i)(B).

The steam supply valves to the turbine driven AFW pump had been closed four days earlier during the cooldown associated with the mid-cycle shutdown. During the subsequent heatup in preparation for a return to power, a combination of a procedural inconsistency and a misinterpretation regarding AFW pump operability resulted in the failure to reopen the steam supply valves to the turbine driven AFW pump prior to the RCS temperature exceeding 350°F.

Immediate action was to reopen the steam supply valves thus returning the turbine AFW pump to service. The turbine driven AFW pump was inoperable for approximately 7 hours with RCS temperature greater than 350°F. During the period of pump inoperability, the maximum RCS temperature was approximately 390°F. Upon heating the RCS to greater than 350°F, plant technical specifications allow one AFW pump to be out of service for 72 hours.

Procedures will be revised to provide further guidance in determining AFW pump operability and to correct any inconsistencies.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3120-0104
EXPIRES: 8/31/86

FACILITY NAME (1) Kewaunee Nuclear Power Plant	DOCKET NUMBER (2) 0 5 0 0 0 3 0 5	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 308A's) (17)

Description of Event

On August 27, 1988 the Kewaunee Nuclear Power Plant (KNPP) experienced high cation conductivity in the condensate/feedwater [SJ] system. A plant shutdown was initiated to facilitate cleanup of the secondary system water based on recommendations by Westinghouse Electric Corporation. The KNPP control room operations personnel proceeded with implementing the plant power reduction and eventually entered procedure N-0-05 entitled "Plant Cooldown from Hot Shutdown to Cold Shutdown Condition". Step 4.6 of procedure N-0-05 directs operations personnel to commence a cooldown per procedure N-MS-06 "Main Steam and Dump System". The cooldown was commenced and the plant was cooled to a point where the reactor coolant system (RCS) hot leg temperature was approximately 300°F. Based on the Westinghouse recommendation, the RCS hot leg temperature was to be maintained within a range of approximately 300°F to 350°F. This temperature range was considered to be the temperatures at which the secondary side chemistry cleanup would be most effective.

During implementation of the plant cooldown, step 4.3.7 of procedure N-MS-06 required closure of valves [V] MS-100A and MS-100B when the RCS hot leg temperature decreased to below 300°F. MS-100A and MS-100B are remote operated valves controlled from the control room. These valves are located on the steam supply lines to the turbine driven auxiliary feedwater (AFW) pump [P]. As RCS hot leg temperature decreased to less than 300°F during the cooldown, operations personnel closed valves MS-100A and MS-100B isolating the steam supply to the Terry turbine [TRB] on the AFW pump. The plant was maintained in the intermediate shutdown condition (THOT 325°F, RCS pressure 375psig) for several days as the secondary side water cleanup evolution continued.

On August 31, 1988 following successful cleanup of the secondary system, a plant heatup was commenced in preparation for the return to 100 percent power. Operations personnel recognized that the procedures at KNPP were developed assuming a startup from a cold shutdown condition, and not written specifically for startup from an intermediate shutdown condition. However procedure N-0-01 entitled "Plant Startup from Cold Shutdown Condition to Hot Shutdown Condition" could be utilized implementing the applicable steps. Operations department management personnel reviewed the procedure and identified the steps that were applicable to bring the plant from an intermediate shutdown condition to a hot shutdown condition. The control room operators proceeded with a plant heatup utilizing procedure N-0-01. Step 4.16 of procedure N-0-01 requires the operator to proceed with procedure N-MS-06.

N-MS-06 was written to provide direction for an RCS heatup from the cold shutdown condition. Since the plant was already in the intermediate shutdown condition the operators were required to determine at which point the procedures should be entered. It was reasoned that since the plant was already at a RCS temperature of 325°F, procedure N-MS-06 should be entered at step 4.1.2, and therefore step 4.1.1.3 which directs the operator to open valves MS-100A and MS-100B was bypassed. Step 4.1.2 provides guidance on initiating a warmup to

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED ONS NO. 3120-0104

EXPIRES: 6/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Kewaunee Nuclear Power Plant	0500030588	88	011	00	03	OF	06

TEXT (If more space is required, use additional NRC Form 386A's) (17)

the main steam system. Step 4.1.1 was determined not to be applicable since the current plant conditions were beyond those normally present when performing the step. Plant startup continued with the implementation of procedure N-0-01 and eventually reached step 4.27 of the procedure.

Step 4.27 of procedure N-0-01 states "Prior to RCS Hot Leg Wide Range Temperature exceeding 350°F ensure that the requirements of N-0-01-CLC are met." Procedure N-0-01-CLC is a checklist that must be completed by the operators to ensure that all plant requirements are met prior to exceeding an RCS temperature of 350°F. In particular, item 1.2 of the checklist requires verification that three auxiliary feedwater pumps are operable. This verification is intended to ensure conformance with technical specification 3.4.a.2, which requires three AFW pumps operable prior to the reactor being heated above 350°F. Both control room operators evaluated the status of the auxiliary feedwater pumps and determined that all three pumps were operable and proceeded with the plant startup utilizing procedure N-0-01. At 1500, with the RCS still less than 350°F, a shift change occurred. The on-coming shift (1500-2300) was informed that all preparations had been completed for the RCS heatup to greater than 350°F and that they were to continue with the heatup to approximately 400°F at which point the residual heat removal system would be secured.

At 2315 the same day, with the RCS hot leg temperature at 388°F and the RCS pressure at 1000 psig, the on-coming shift (2300-0700) control room operators recognized that valves MS-100A and MS-100B were in the closed position and questioned the operability of the turbine driven AFW pump. MS-100A and MS-100B were immediately opened which re-established the steam supply to the turbine driven AFW pump and therefore returned the pump to an operable status. The plant startup continued, and the plant was subsequently returned to power operation.

Cause of Event

The cause of this event was the operators' failure to recognize that the turbine driven AFW pump was inoperable due to the closure of valves MS-100A and MS-100B. Upon evaluating the pump status during performance of checklist N-0-01-CLC, one of the control room operators reasoned that, since both motor driven AFW pumps had been used during the shift in performing the steam generator flushing for cleanup, the two motor driven pumps and the associated valves and piping were operable. When evaluating the turbine driven auxiliary feedwater pump, it was noted that steam header pressure was normal for the plant conditions at the time. Based on this information and knowing that maintenance had not been performed on the system, all three auxiliary feedwater pumps were considered operable. The other control room operator also evaluated the AFW pump status and recognized that valves MS-100A and MS-100B were closed. He also noted that all three AFW pumps were in pullout at the time. Placing the AFW pumps in pullout whenever the main feedwater pumps are tripped during startup, low power, and shutdown operations is an operating practice that has been proceduralized

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3180-0104

EXPIRES: 8/31/88

FACILITY NAME (1) Kewaunee Nuclear Power Plant	DOCKET NUMBER (2) 0500030588	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		88	011	00	04	OF 06

TEXT (If more space is required, use additional NRC Form 386A's) (17)

and reviewed and concurred with by the NRC. Since some form of manual action would be required to start the turbine driven AFW pump, regardless of MS-100A and MS-100B valve position, the operator did not recognize the valve closure as a condition that renders the pump inoperable. Since there were no tagouts or out of service stickers present on the equipment and to the best of his knowledge no equipment within the system had been taken out of service, he considered all three AFW pumps operable and initialed checklist N-0-01-CLC to indicate such. In this case, the term operable was interpreted by the operator to mean that the pump was available.

A contributing factor in this event was the closure of valves MS-100A and MS-100B by the operating crew performing the plant shutdown/cooldown. The plant cooldown was proceeding such that RCS temperature was approaching 300°F; however, the plan was to maintain RCS temperature within a range of approximately 300°F and 350°F. As the cooldown progressed, RCS temperature decreased to less than 300°F. The operating crew implemented step 4.3.7 of N-MS-06 which requires closure of MS-100A and MS-100B when RCS temperature is less than 300°F. A closure of these valves at an operating temperature of 300°F is normally performed during a cooldown to the Cold Shutdown condition. Since RCS temperature was to be maintained between approximately 300°F and 350°F, valve closure was not expected to be required. During the subsequent startup evolution from an intermediate shutdown condition, the entry into procedure N-MS-06 at step 4.1.2, which bypassed step 4.1.1.3, resulted in the failure to open valves MS-100A and MS-100B. In any case, closure of these valves and the effect the valve closure has on the turbine driven auxiliary feedwater pump operability should have been reconciled during the subsequent plant startup during the performance of procedure checklist N-0-01-CLC prior to exceeding 350°F.

Analysis of Event

The KNPP technical specifications require that the reactor shall not be heated above 350°F unless three auxiliary feedwater pumps are operable. The basis section of the technical specifications states "In the unlikely event of complete loss of electrical power to the plant continued capability of decay heat removal would be assured by the availability of either the steam-driven auxiliary feedwater pump or one of the two motor-driven auxiliary feedwater pumps, and by steam discharge to the atmosphere through the main steam safety valves." In addition it states "Any single auxiliary feedwater pump can supply sufficient feedwater for removal of decay heat from the reactor."

During this incident the reactor was heated to greater than 350°F with the steam supply to the turbine driven AFW pump isolated thus, by definition, rendering the pump inoperable. Both motor-driven AFW pumps were operable and both diesel generators were operable and capable of supplying power to the motor driven pumps in the event of a loss of offsite power. The plant heatup resulted in the RCS temperature exceeding 350°F at approximately 1600 on August 31, 1988; the valves were recognized as closed at 2315 the same day and were opened returning

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMS NO. 3180-0104

EXPIRES: 6/31/86

FACILITY NAME (1) Kewaunee Nuclear Power Plant	DOCKET NUMBER (2) 0500030588	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		88	011	00	05	OF	06

TEXT (If more space is required, use additional NRC Form 305A's) (17)

the turbine driven AFW to an operable status. The turbine driven AFW pump therefore was out of service for approximately seven hours. At the time of valve opening the RCS temperature was approximately 390°F. Technical specification 3.4.c allows one AFW pump to be inoperable for 72 hours after the RCS temperature is above 350°F.

It is important to note that one AFW pump is considered sufficient to remove the decay heat produced from the reactor following a full power reactor trip. In this case, with the plant having been shutdown for four days and RCS temperature at 390°F, the heat removal capability of one AFW pump is more than adequate to remove the minimal decay heat. Although the turbine driven AFW pump was not technically "operable" due to the steam supply valve closure, the pump could have been utilized in the event of a loss of both motor driven AFW pumps. Manual action would have been necessary to return the turbine driven AFW pump to service, however, the heat load in the RCS was such that sufficient time would have been available for the operators to perform the necessary manual actions. These actions are all performed from the control room.

Based on the availability of the turbine driven AFW pump, the operability of the two motor driven AFW pumps and their associated diesel generators, and the minimal plant heat load, this incident did not affect the health and safety of the public.

Since the reactor was heated above 350°F without all three AFW pumps operable this incident is considered an operation or condition prohibited by the plant's technical specifications (T.S. 3.4.a.2) and as such is reportable in accordance with 10CFR50.73 (a)(2)(i)(B).

Corrective Actions

Checklist N-0-01-CLC currently requires that two operators verify that the three AFW pumps are operable prior to exceeding 350°F. The checklist will be revised to provide further guidance in determining AFW pump operability. The checklist will indicate that main steam supply to the turbine driven AFW pump is necessary before the pump can be considered operable. This should resolve the operator misinterpretation regarding pump operability versus pump availability.

Currently, closure of valves MS-100A and MS-100B occurs at 300°F during a cooldown per step 4.3.7 of procedure N-MS-06, and opening of these valves occurs at step 4.1.1.3 of procedure N-MS-06 during an RCS heatup. Step 4.1.1 however is directed at a plant heatup from the cold shutdown condition. If the plant does not proceed completely to the cold shutdown condition, step 4.1.1.3, may not be implemented during the subsequent heatup. Therefore, the basis for step 4.3.7 of procedure N-MS-06, which requires the closure of valves MS-100A and MS-100B at 300°F during a cooldown, will be determined. Based on this evaluation, the procedure will be revised as appropriate to ensure that valve closure and subsequent opening occurs.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMS NO. 3180-0104

EXPIRES: 6/31/86

FACILITY NAME (1) Kewaunee Nuclear Power Plant	DOCKET NUMBER (2) 0 5 0 0 0 3 0 5 8 8 — 0 1 1 — 0 0 0 6 OF 0 6	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			

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This Licensee Event Report will be routed to the reactor operators and senior reactor operators for information.

Additional Information

None.

WPSC (414) 433-1598
TELECOPIER (414) 433-1297



EASYLINK 62891993

WISCONSIN PUBLIC SERVICE CORPORATION

600 North Adams • P.O. Box 19002 • Green Bay, WI 54307-9002

September 30, 1988

10 CFR 50.73

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Reportable Occurrence 88-011-00

The attached Licensee Event Report for reportable occurrence 88-011-00 is being submitted in accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System."

Sincerely,

C. R. Steinhardt
Manager - Nuclear Power

PIS/jms

Attach.

cc - INPO Records Center
Mr. Robert Nelson
US NRC, Region III

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