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AUTH.NAME AUTHOR AFFILIATION
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MARCHI,M.L. Wisconsin Public Service Corp.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 95-007-01:on 951109,inoperable auxiliary feedwater pump discovered,due to inadequate lube oil.Oil was added to TDAFP,& pump satisfactorily tested & returned to SVC. W/960919 ltr.

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September 19, 1996

10 CFR 50.73

U. S. Nuclear Regulatory Commission
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Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Reportable Occurrence 95-007-01

References: 1) Letter from M. L. Marchi (WPSC) to NRC Document Control Desk, dated December 14, 1995, (Licensee Event Report 95-007-00)

2) Letter from C. R. Steinhardt (WPSC) to NRC Document Control Desk, dated March 1, 1996, (Reply to Notice of Violation)

In reference 1, Wisconsin Public Service Corporation (WPSC) provided the Nuclear Regulatory Commission (NRC) with Licensee Event Report (LER) 95-007-00, involving the turbine-driven auxiliary feedwater pump. In that report it was noted that a supplemental report would be provided to the NRC following completion of our investigation and corrective actions resolving the pump lube oil level problem. Attached is the supplemental report. Included in this report is information gained from the event investigation and the status of the corrective actions. New or revised information is identified with redlining.

Sincerely,

M. L. Marchi
Manager - Nuclear Business Group

MEA
Attach.
cc - INPO Records Center
US NRC Senior Resident Inspector
US NRC, Region III

IE24

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

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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LICENSEE EVENT REPORT (LER)

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FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Kewaunee Nuclear Power Plant	05000305	1 OF 17

TITLE (4)
Inoperable Auxiliary Feedwater Pump Due to Inadequate Lube Oil

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
11	09	95	95	-- 007 --	01	09	19	96	N/A	05000
									FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	098

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)	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)
Mark Aulik	(414)388-2560 ext. 2721

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	BA	P	P025	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)

At 0955 CST on November 9, 1995, with the plant at 98% power, SP 05B-105, "Turbine Driven AFW Pump and Valve Test - IST", was being performed. During the performance of SP 05B-105, the Turbine Driven Auxiliary Feedwater (TDAFW) pump failed to start. The failure of the pump to start was the result of the lube oil pressure permissive not being satisfied. Local indication showed that lube oil pressure was at approximately 8 psig. To satisfy the start permissive, the lube oil pressure must be > 10 psig.

The cause of the event was the removal of a portion of the oil from the TDAFW pump oil cooler on October 27, 1995. The oil was removed due to an observed high level in the oil reservoir. Removing the oil from the oil cooler created a void in the lube oil system. The void prevented the auxiliary lube oil pump from providing the required 10 psig oil pressure to allow starting of the TDAFW pump within the acceptance criteria of sixty seconds. After the failure, oil was added to the pump reservoir and the pump was satisfactorily tested and returned to service. The pump in retrospect, had been out of service for thirteen days, which exceeded the 72 hour Limiting Condition for Operation of the Kewaunee Technical Specifications.

SYSTEM BACKGROUND

Auxiliary Feedwater System

The Kewaunee Plant has an Auxiliary Feedwater (AFW) [BA] System design with two motor driven pumps [P] and one turbine driven pump (see attached Figure 1), each individually capable of supplying sufficient feedwater for removal of decay heat from the primary system. Originally the turbine driven auxiliary feedwater (TDAFW) pump was installed as a spare pump credited with providing system diversity; however, in the early 1980s, an evaluation of the auxiliary feedwater piping and valve configuration identified single failure vulnerabilities with the two pump operating configuration. Specifically, vulnerabilities were identified for those events requiring isolation of a faulted or ruptured steam generator (i.e., a non-isolable main steam line pipe break or a steam generator tube rupture) coincident with a failure of the motor driven auxiliary feedwater (MDAFW) pump providing flow to the intact steam generator (or the turbine driven pump if it was being relied upon as an operable pump). To address this concern, the Kewaunee Technical Specifications were revised to require a three pump operating configuration. Additionally, the TDAFW pump is relied upon for coping with a station blackout event as required by 10CFR50.63.

Auxiliary Feedwater Pumps

Upon initiation of an auxiliary feedwater pump start signal, the start signal will first cause the auxiliary lube oil [LL] pump to start. The auxiliary lube oil pump provides forced fed lubrication to the pump bearings. The lube oil system consists of an auxiliary lube oil pump, oil cooler [CLR], oil filter [FLT], oil reservoir [RVR], shaft-driven lube oil pump, and instrumentation. When lube oil pressure increases to > 10 psig, the starting permissive is satisfied and the MDAFW pump breaker closes or the TDAFW pump steam isolation valve, MS-102, opens and provides steam to the pump's turbine. The auxiliary lube oil pump provides the necessary lube oil pressure until the shaft driven lube oil pump can supply the pump with lubricating oil. As the AFW pump speed increases, the shaft driven oil pump will cause oil pressure to increase and at 15.5 psig,

the auxiliary lube oil pump will stop. This will leave the shaft driven oil pump providing lubrication. The auxiliary lube oil pump will restart on decreasing oil pressure as the AFW pump coasts down after operation, or upon failure of the shaft driven pump. The setpoints for restart of the auxiliary lube oil pump are 10 psig for the MDAFW pumps and 8.9 psig for the TDAFW pump. If lube oil system pressure decreases to 4 psig, an AFW pump trip signal is initiated.

DESCRIPTION OF EVENT

At 0955 CST on November 9, 1995, with the plant at 98% power, SP 05B-105, "Turbine Driven AFW Pump and Valve Test - IST", was being performed. SP 05B-105, directs the licensed operator to start the Turbine Driven Auxiliary Feedwater (TDAFW) pump from the control room. Prior to this step, a non-licensed operator locally checked the TDAFW pump and confirmed an adequate lube oil level.

During the start sequence, the auxiliary lube oil pump started and increased lube oil pressure to approximately 8 psig. Since a lube oil pressure of 10 psig was not achieved, the start permissive was not satisfied and the steam isolation valve, MS-102, did not open. The control room operator tried to start the auxiliary feedwater pump for approximately 90 seconds after which the start was aborted and the auxiliary feedwater pump control switch was returned to the Stop/Auto position. During this time the local lube oil level was observed to be below the "Add Oil Operating" mark on the sight glass [LG] placard (see attached Figure 2). The auxiliary lube oil pump continued to operate for an additional three minutes after which it was manually stopped. At the time the auxiliary lube oil pump was stopped, the lube oil pressure had slowly increased to nearly 10 psig. The auxiliary lube oil pump was stopped locally before its discharge pressure reached 10 psig in order to prevent an unexpected start of the TDAFW pump. Operations management, maintenance, instrumentation & control, plant licensing, engineering, and the Shift Technical Advisor were notified of the event.

Discussions with maintenance revealed that oil had been removed from the TDAFW pump, as requested by the operations department, on October 27, 1995, due to an indicated high oil level. Based on this information, approximately one-half quart of oil was added to the TDAFW pump reservoir. The auxiliary lube oil pump was then started, and lube oil pressure was observed to quickly increase to greater than 10 psig. While the auxiliary lube oil pump was operating, an additional quart of oil was added to the oil reservoir after which the auxiliary lube oil pump was stopped. Operations subsequently performed SP 05B-105, "Turbine Driven AFW Pump and Valve Test - IST", with no problems. During SP 05B-105, another one-half quart of oil was added to bring the oil level up to the middle of the "Normal Operating Range". The TDAFW pump was returned to service at 1210, November 9, 1995.

Maintenance also stated that in addition to removing oil from the TDAFW pump, oil was also adjusted in both Motor Driven Auxiliary Feedwater Pumps (MDAFWPs) on October 27, 1995. The exact amount of oil removed from each pump is not known, however, it is estimated a combined total of two gallons was removed from all three pumps. The lube oil system for each pump holds approximately five gallons.

At 1230 on November 9, 1995, after completion of SP 05B-105 on the TDAFW pump, a partial SP 05B-104, "Motor Driven AFW Pump and Valve Test - IST", was performed on both the A and B MDAFW pumps. Prior to performance of the partial SP 05B-105, initial oil levels for both of the MDAFW pumps were observed to be adequate. The auxiliary lube oil pumps were then started individually and both pumps achieved greater than 10 psig lube oil pressure in less than five seconds. This test verified the amount of oil present in the system was adequate to satisfy the start permissive in the event the MDAFW pumps received an automatic start signal. With the auxiliary lube oil pumps operating, lube oil levels were above the "add oil" mark, but below the normal range mark. Approximately one pint of oil was added to the MDAFW pump A reservoir and one-half pint was added to the MDAFW pump B reservoir. The partial MDAFW pump surveillance procedure was then performed with no problems. Subsequent to the surveillance procedure, based

upon the oil level indication with the pump stopped, additional oil was added to the MDAFW pumps at 0300 on November 10, 1995.

ANALYSIS OF EVENT

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation or a condition prohibited by the plant's Technical Specification. The following analyses addresses the specific failure of the TDAFW pump and the potential for the degradation of all three AFW pumps.

Consequences of the TDAFW Pump Not Starting

For this specific event, a number of factors reduced the safety significance:

1) During the thirteen days the turbine driven pump was degraded, both motor driven pumps were operable and, if required, could have provided a supply of auxiliary feedwater to the steam generators.

2) The two motor driven pumps also continued to provide single failure redundancy to address the majority of design basis events (large break LOCA, small break LOCA, isolable secondary line breaks, loss of main feedwater, etc.).

3) Substantial margin to steam generator dryout conditions is provided by the large operating water inventory in the Kewaunee steam generators. Even under a condition involving a total loss of all feedwater, approximately 30 minutes of decay heat removal remains available in the steam generators. This time would allow local operator action to restore the TDAFW pump to service. Prior to this event, a safety analyses to support proposed technical specification amendment 120A, which clarified

the AFW system limiting conditions for operation, had been completed and concluded that a delay in auxiliary feedwater initiation has no safety consequences.

This limited vulnerability of the plant is further substantiated by the small increase (<4%) in annualized core damage frequency with a TDAFW pump inoperable for a short duration (i.e., thirteen days). A singular activity that increases the annualized core damage frequency by less than 10% is generally regarded as an acceptable risk.

In addition, even though the TDAFW pump lubricating oil permissive was not satisfied and the pump did not start within the 60 second requirement, at the time the lube oil pump was secured, observers reported that lube oil pressure was continuing to increase and was approaching the permissive setpoint. With this observed increasing pressure, there is the potential that had the pump been allowed to continue operating the permissive would have been satisfied in a short period of time and the TDAFW pump would have successfully started and provided fiow. Furthermore, only one-half quart of oil was added to the lube oil pump reservoir to immediately achieve the TDAFW pump start permissive.

Consequences of the TDAFW Pump Not Starting with Additional Single Failure or Station Blackout

If the TDAFW pump had not eventually started, and

A) there had been the need for steam generator isolation with the additional failure of a MDAFW pump (as described in the "Background" section), or

B) there had been a station blackout,

the capability to supply auxiliary feedwater would have been substantially degraded. The safety consequences of these postulated events are minimized by a number of factors.

As previously stated, there would be at least 30 minutes of steam generator inventory available for decay heat removal. And for the steam generator isolation transients of concern, even additional margin is available. A main steam line break is a cooldown transient with auxiliary feedwater flow not a critical parameter in the early stages of the transient. A major concern of this event is excessive cooldown. During a steam generator tube rupture with the additional failure of the motor driven auxiliary feedwater pump supporting the intact steam generator, continued auxiliary feedwater addition is not required if a minimum steam generator level is maintained in the ruptured steam generator which would be expected with reactor coolant inleakage. If eventually required, the addition of auxiliary feedwater to the ruptured steam generator will complicate recovery, delay isolation, and may result in additional radiological releases. However, the current analysis assumes an activity concentration in the primary system equivalent to operation with 1 percent defective fuel clad; the total activity associated with a 30 minute transfer of primary coolant to the steam generators is assumed to be released. This results in doses of approximately 1% of 10CFR100 limits. These low values, together with the Kewaunee history of operation with primary activity at a small fraction of the analyzed values, provide margin for delay in steam generator isolation with any resultant continued release. Safety injection to the primary system and any additional feedwater will also assist in the cooldown and provide additional time for recovery of the failed pump. If the event was a station blackout, within 30 minutes local operator action, as discussed below, could have been taken to restore auxiliary feedwater.

Potential Degradation of All Three Auxiliary Feedwater Pumps

It is also recognized that the oil level adjustment made during this event could have resulted in the degradation of all the auxiliary feedwater pumps (a potential common mode failure). This has a much greater safety significance. Within the worst case 30 minute time frame, control room and local operator action can be taken to recover auxiliary feedwater. The operator response to the loss of the TDAFW pump or all the AFW pumps due to inadequate lube oil can be characterized as follows:

After recognition of an auxiliary feedwater pump failure to start, the following actions can be taken:

1) If main feedwater or condensate is available, the control operator would initiate flow from these systems to provide primary cooling until auxiliary feedwater is available or primary conditions permit initiation of the residual heat removal system. This action relies on offsite power being available.

2) An operator would be dispatched to determine the AFW problem. In this event the operator would observe that there was a low lube oil level indication and that the lube oil pumps were operating and providing discharge pressure. The operator would report these conditions to the control room and follow their direction. If, as expected, time permits, the operator can be instructed to obtain oil readily available from the oil storage area and use tools located near the pumps to add the necessary oil to allow pump start. If time is critical, and since lube oil pressure is indicated at greater than 4 psig, the operator can be instructed to manually operate the TDAFW pump steam inlet valve to start the pump.

3) If the above actions were not successful, upon reaching minimum levels in the steam generators, operators would initiate a primary system bleed and feed evolution with the safety injection system.

For the circumstances of this event, the most likely response is characterized by the actions described in 1) and 2) above. If these actions are implemented within 30 minutes, plant response will remain within the analyzed transients, except for a small break LOCA. The current SBLOCA analysis assumes auxiliary feedwater is available within 630 seconds with a resulting peak clad temperature of 1020°F. Previous qualitative assessments by the vendor for the SBLOCA analysis of record have indicated that the acceptance value of 2200°F would not be exceeded if auxiliary feedwater is delayed for 30 minutes.

However, any of these operator actions should ensure that there is adequate reactor core cooling.

CAUSE OF EVENT

The failure of the TDAFW pump to start was due to the draining of a portion of oil from the pump's lube oil cooler. The oil was drained on the morning of October 27, 1995, by a utility maintenance person, as requested by the shift supervisor. The shift supervisor had requested the oil be drained due to the indicated level nearly being out-of-sight high in the sight glass. The maintenance person believed that if there was any in-leakage to the oil system, it would be from the cooling water, and therefore, the oil was first drained from the lube oil cooler. In observing the oil being drained from the oil cooler no water was identified. Approximately one quart of oil was removed from the cooler. While the oil was being drained, the maintenance person did not notice any corresponding level change in the sight glass. Since it was easier to drain the oil from a larger diameter pipe directly off the bottom of the oil reservoir, he switched to this drain path. Draining continued until the indicated level was at the "Full/Stopped" mark on the sight glass. The sight glass indication of adequate oil level was relied upon as the activity retest.

An investigation was conducted to determine why the local sight glass oil level did not change when the oil was drained from the oil cooler. This investigation determined that due to the configuration of the piping, draining from the oil cooler created a void in the lube oil system. This void prevented the oil level in the sight glass from indicating the true amount of oil in the lube oil system. The maintenance person did not recognize that a void could be created by the draining of oil from the oil cooler and that the reservoir sight glass may not be a good indication of the amount of oil in the entire system.

Event Background

Prior to the May 1994 refueling outage, shorter sight glasses were in-place which prevented the operators from observing oil levels when the pump was shut off. Normal oil levels with the pump off were out-of-sight high. During the outage, the sight glasses for all three AFW pumps were replaced under Design Change Request

(DCR) 1974. This DCR installed taller sight glasses in order to allow the operators to observe the oil levels with the pump off and detect any potential coolant in-leakage.

An issue regarding oil level fluctuation was identified within the operations department following the May 1994 refueling outage. With the installation of the taller sight glasses, small increases in oil level with the pumps off were observed by the operators during their routine plant tours. In February of 1995, operations requested assistance from the engineering and technical support group to investigate the reason for this increasing level. Initially, since the levels were out-of-sight high on the sight glass, engineering requested reducing the oil level to allow viewing of an on-scale reading. Oil levels were then recorded by the operations department every six hours for seven months. Oil additions and oil removals were also recorded for the engineering department. However, since oil levels appeared adequate, the oil level concern was not perceived by the engineering group as a safety concern or pump operability issue, and therefore a resolution for why the oil level continued to increase with the pumps off was not given a high priority.

The TDAFW pump was successfully operated on September 5, 1995 during the recovery from an unplanned Reactor Trip. After the pump was shutdown, oil was added to the reservoir based on the "Low Oil Level Stopped-After 2 Hours Add Oil" mark on the sight glass placard. Consistent with recent trends (although still not understood), over the next month indicated oil level increased, resulting in operations requesting maintenance to have the oil level adjusted on October 27, 1995.

Evaluation Results

After evaluating the oil level data taken by the operations department every six hours for seven months, it was revealed that the oil level increases slowly over time and that equilibrium oil levels are not attained for weeks after operation of the AFW pump or auxiliary lube oil pump. The reason for the slow level increase is the

slow return of oil to the reservoir from the pump's bearings. The increase from the return of oil is most evident at the upper end of the sight glass due to the non-linear changes in indicated level for a given change in reservoir volume. At the upper end of the sight glass, even small amounts of oil draining back to the reservoir will result in an observable level increase.

Prior to the event, since WPSC did not fully understand this slow level increase, oil was being added to the pump reservoir based on a "Low Oil Level Stopped-After 2 Hours Add Oil" mark on the sight glass placard. The origin of the lines on the sight glass placard is believed to be derived from historical operating values. Since the sight glasses were only made slightly taller, the placard was not re-verified or changed through the design change process.

We now know that the observed increase in oil level was due to the delay in reaching equilibrium levels. We also now know that oil additions two hours after pump shutdown only compounded the out of sight high indication weeks later. Prior to replacement of the sight glasses per DCR 1974, oil level was out of sight high when the pump was in the standby mode. Therefore, the delayed increase in level could not be observed in the sight glass. After replacement of the sight glasses, the expectation was to maintain the oil level in the sight glass. This resulted in the operators requesting the oil level be lowered to the "Full/Stopped" mark at least three times following the 1994 outage.

Oil Level Adjustment

During discussions with maintenance, the draining evolution was equated in significance to periodic oil additions. The task was regarded as a "skill of the craft" work activity and was allowed to proceed with informal controls and not required to be covered by procedure. The removal of small amounts of oil from the oil cooler was considered similar to periodically obtaining oil samples for analysis. The maintenance procedure for oil sampling does not require operating the auxiliary lube oil pump after draining the oil. It is

now recognized that operating the auxiliary lube oil pump after draining the oil would fill any potential voids that may have been formed.

Assessment

Due to the significance of this event a team was formed to investigate and evaluate the factors contributing to the occurrenee. Members of the team conducted numerous interviews and reviewed all associated documents. The assessment concluded that no single root cause for the event was identified but rather, a number of contributing causes each played a part to some degree. The contributing causes were grouped as follows:

1) Inadequate AFW Lube Oil System Knowledge

A general lack of understanding of the AFW pump lube oil system contributed significantly to this event. The potential for crcating a void in the oil cooler during draining was not recognized. Incorrect information on the sight glass placard resulted in the repeated addition and removal of oil.

2) Inadequate Management of Systems

This event indicates a need to improve the way we prioritize, schedule, perform and document our work. The small oil level fluctuations appeared to be insignificant, but the lack of a resolution resulted in the oil adjustments being considered a routine activity. More management involvement may have increased attention to resolving the issue. Overall work control measures including work requests and procedural guidance need to be addressed to improve performance and documentation of work.

3) Lack of a Questioning Attitude

Failure to question the scope and impact of the draining evolution, as well as a failure to verify a corresponding level change during draining were contributing factors. Asking the proper questions and a proactive approach in answering those questions may have prevented this event from occurring.

CORRECTIVE ACTIONS

Short Term

1) Oil was added to the Turbine Driven Auxiliary Feedwater Pump, and it was satisfactorily tested and returned to service.

2) The Motor Driven Auxiliary Feedwater Pumps A and B were satisfactorily tested to ensure operability.

3) Operations Management issued a letter regarding specific guidance on maintaining the proper oil level in the AFW pumps. This included specific actions requiring operation of the auxiliary lube oil pump to remove any voids in the lube oil piping system, as a retest during oil additions. Further guidance was provided to the operators to aid their response to a low level or high level indication. Danger cards were placed on the AFW pump lube oil pump lube oil sight glasses warning personnel to use the interim guidance for maintaining proper oil inventory.

4) The Plant Manager issued short term guidance requiring that all unplanned, non-periodic maintenance activities affecting safety-related equipment be performed using the plant work request system. Any exceptions to this practice required Plant Operations Review Committee endorsement and Plant Manager approval.

Long Term

1) To replace the interim compensatory action described in the short term corrective action (#3), operations procedure N-FW-05B, Auxiliary Feedwater System and A-FW-05B, Abnormal Auxiliary Feedwater, were revised to include specific guidance on maintaining proper oil levels in the AFW pumps. The revision to the abnormal procedure included steps to ensure either the auxiliary lube oil pump or the AFW pump was operating to remove any voids in the lube oil piping system, during oil additions.

2) Maintenance procedure PMP 05B-01, AFW System Auxiliary Feedwater Pump Maintenance, was revised to include the proper steps to perform periodic sampling of oil from the AFW Pumps. The revision included a step to notify operations to operate the auxiliary lube oil pump to remove any voids in the lube oil piping system, as a retest following oil sampling.

3) This event was included as part of the mechanical maintenance and operations department continuous training. This training included specific discussions of the AFW Pump lube oil system. The plant engineering group has been made aware of the event and will receive formal training following the Fall refueling outage.

4) The investigation into the lube oil level fluctuations was completed and the concern associated with slowly increasing level was resolved. This included replacing the placard adjacent to the reservoir sight glass to permit small level fluctuations without requiring the addition or removal of oil.

5) The procedure detailing requirements for maintenance work control, GNP 8.2.1, Work Request Processing, was revised to clarify the expectations for adequate work controls. The revised procedure replaced short term corrective action #4. Also, included in the revision were attachments providing

guidance on performing adequate component retests. Training on the revised procedure was then performed with the operations, maintenance, and engineering work groups.

6) A program for identifying, documenting, and prioritizing "operator work arounds" had been recently established prior to the event. The program was reviewed in regard to the TDAFW pump oil level problem. No required program changes were identified.

7) Prior to the event a team had been formed to develop and implement a work management system for engineering work. The expected outcome is a process which will improve planning and prioritization of engineering work through improved inter-departmental communications. The work management system is currently being implemented with on-going refinements.

8) A review of other safety-related lubricating systems was performed to identify other pumps which may be susceptible to a similar failure mechanism. None were identified with the potential for creation of a void resulting in an incorrect oil indication following oil level adjustment.

9) A multi-disciplinary review was performed to determine the adequacy and appropriateness of the post-maintenance test and retest requirements specified in existing maintenance procedures. A minimum sample of twenty safety-related, planned, periodic maintenance procedures were reviewed for each of the participating work groups (i.e., mechanical maintenance, electrical maintenance, instrument and control). The results showed that although some improvements could be incorporated, no significant safety risks were identified. As a result of this review, a checklist was created to aid in the verification of the necessary post-maintenance test for periodic maintenance procedures. The checklist is currently being used as appropriate by the plant work groups (i.e., mechanical maintenance, electrical maintenance, instrument and control).

10) The Plant Manager has issued a letter reinforcing expectations to support WPSC's commitment to excellence in human performance. Controlling the factors that influence human performance and continuously striving to improve our processes and work practices were emphasized. The letter will be followed up with formal training for each of the plant work groups. A general need for a questioning attitude, self-checking, and conservative decision making when performing work activities will be discussed.

ADDITIONAL INFORMATION

The auxiliary feedwater pumps are Pacific pumps, Model UNI.

Similar Events: None

SEQUENCE OF EVENTS

1994 Refueling Outage	DCR 1974 implemented to provide a taller sight glass to allow the equipment operator to observe the pump oil levels at all times.
May 1994 thru February 1995	Fluctuations identified in lube oil levels. Operations observed small level increases after pump shutdown.
February 1995	Engineering requested to investigate level fluctuations. Oil drained to adjust level to support investigation.
February 1995 thru October 1995	Oil levels adjusted several times.
October 27,1995	Oil level adjusted in all three AFW Pumps.

NOVEMBER 9, 1995 SEQUENCE OF EVENTS

-- SP 05B-105, Turbine Driven AFW Pump and Valve Test being performed.

-- TDAFW Pump checked locally

-- Control room operator attempts start of pump

-- At 0955 the auxiliary lube oil pump starts, but 10 psig oil pressure is not obtainod

-- SP 05B-105 stopped, investigation began

-- One half quart of oil added to TDAFW pump, auxiliary lube oil pump operated to verify adequate oil pressure

-- An additional one quart of oil added to raise level in the normal operating range

-- At 1210 SP 05B-105 completed and TDAFW pump returned to service. During SP an additional one-half quart of oil was added.

-- At 1326 SP 05B-104 performed on MDAFW pumps

-- On November 10, 1995 at 0300 added oil to MDAFW pumps to raise level in the normal operating range