ACCELERATED DOCUMENT DISTRIBUTION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9301130181 DOC.DATE: 93/01/07 NOTARIZED: YES DOCKET #
FACIL:50-269 Oconee Nuclear Station, Unit 1, Duke Power Co. 05000269
50-270 Oconee Nuclear Station, Unit 2, Duke Power Co. 05000270
50-287 Oconee Nuclear Station, Unit 3, Duke Power Co. 05000287
AUTH.NAME AUTHOR AFFILIATION
HAMPTON,J.W. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Revises response to NRC Bulletin 88-004 re potential safety related pump loss.Current guidance & practice sufficient to ensure that no pump damage will occur from low flow operation.

DISTRIBUTION CODE: IE37D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 5
TITLE: Bulletin 88-004 re Potential Safety-Related Pump Loss

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-3 LA	1	0	PD2-3 PD	1	1
	WIENS,L	1	1			
INTERNAL:	AEOD/DOA	1	1	AEOD/DSP/TPAB	1	1
	ALEXION,T 13E21	1	1	MCCOY, M 8E23	1	1
	NRR/DET/EMEB 7E	1	1	NRR/DOEA/OEAB11	1	1
	NRR/DOEA/OGCB11	1	1	NRR/DREP/PEPB9D	1	1
	NRR/DST 8E2	1	1	NRR/PMAS/ILRB12	1	1
	REG FILE 02	1	1	RES/DSIR/EIB	1	1
	RGN2 FILE 01	1	1			
EXTERNAL:	NRC PDR	1	1	NSIC	1	1

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM P1-37 (EXT. 504-2065) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 18 ENCL 17

R I D S / A D D S / R I D S / A D D S

Duke Power Company
Oconee Nuclear Generation Department
P.O. Box 1439
Seneca, SC 29679

J.W. Hampton
Vice President
(803)885-3499 Office
(704)373-5222 Fax

DUKE POWER

January 7, 1993

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

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
NRC Bulletin No. 88-04
Potential Safety Related Pump Loss
Revised Response

In our final response to NRC Bulletin 88-04 dated January 15, 1990, the following statement was made concerning LPSW pumps:

> Based upon previous system performance, and in accordance with good operating practices, the pumps are maintained above their minimum flowrate by selectively opening flowpaths.

By your letter dated October 14, 1992, you requested our review of this response based on NRC Inspection Report Nos. 50-269/92-09, 50-270/92-09, 50-287/92-09 dated April 24, 1992 which documented an occurrence in which Units 1 and 2 LPSW pumps were operated in a deadhead condition.

The purpose of this letter is to revise our response as requested.

Ingersoll-Rand has recommended a minimum continuous flowrate (MCF) of 4250 gpm for Oconee's LPSW pumps. Extended periods of operation at low flow rates (less than MCF) does not normally lead to immediate failure for these pumps. It is recognized, however, that the potential effect of accumulative operation at flow rates less than recommended MCF is accelerated wear due to cavitation and vibration. The cavitation and vibration is due to pump fluid temperature rise and the interaction between various mechanical and hydraulic loads.

The LPSW System for Units 1&2 is a shared system with three pumps and cross-connected headers which provide flow to the various essential and non-essential loads. Normally, two pumps are running with the third pump in standby. The Unit 3 LPSW System has two pumps and cross-connected headers which provide flow to

120016

IE37

the various essential and non-essential loads. Normally, one pump is running with the second in standby. None of the pumps have miniflow recirculation lines. The pumps are normally maintained above their recommended MCF. However, on at least one occasion (as documented in NRC Inspection Reports 50-269/92-09, 50-270/92-09, and 50-287/92-09), an LPSW pump was operated at less than recommended MCF for some period of time.

On February 9, 1992, with Unit 1 at power and Unit 2 shutdown in refueling, the 1B LPSW pump was found operating with its discharge check valve cycling open and shut. Surging could be heard in LPSW piping near the control room and LPSW header discharge pressure and pump amps were cycling. It was determined that the 1A LPSW pump, which was also running at the time (the 1C pump was in standby), had a higher discharge pressure and was causing the discharge valve for the 1B pump to close. As the check valve closed and reduced flow, the 1B LPSW pump would move up on its pump head curve. This resulted in greater developed head and re-opened the discharge check valve. It is believed that the 1B pump did not experience extended deadhead conditions.

The potential effects (cavitation, increased hydraulic loads) of running an LPSW pump with a discharge valve cycling between closed and partially open is expected to be approximately the same as running the same pump at an averaged low, but continuous flowrate. Following the February 1992 event, the B pump was disassembled and inspected. No indications of accelerated wear or failure were found. Likewise, quarterly IWP testing performed since the event has not indicated any unacceptable degradation in performance. Since it typically only takes a few percent of best-efficiency point (BEP) flow (13,500 gpm) to avoid flashing of the pumped fluid, and since the pump inspection did not indicate any unusual wear (from cavitation), it is likely that the average flowrate was sufficient to provide thermal protection. This flow rate, however, was not sufficient to provide mechanical protection from the hydraulic instabilities that occur when operating at less than BEP. The potential effect of this type of operation is expected to be accelerated wear which shortens the time between servicing, but does not lead to immediate failure. The results of the pump inspection and IWP testing are consistent with these expectations.

Ingersoll-Rand recommends limiting operation at or below recommended MCF to no more than 1,000 hours between servicing. Since the LPSW pumps are inspected every shift, they should not be run under conditions of cavitation for more than 12 hours at a time. If cavitation were noted, immediate corrective action would be taken to open additional flowpaths or to secure the affected pump. Quarterly inspection of the pumps under the IWP

program has shown acceptable levels of vibration and developed head. Inspection of the pump internals following 10 years of routine operation identified an increase in clearances but less than a one percent degradation in pump discharge head.

The Oconee LPSW pumps are the same make and model. The three pumps for Units 1&2 have the same set of initial pump curves, as do the two pumps for Unit 3. Due to normal wear and maintenance over time, the head vs. flow curve for one LPSW pump can shift relative to the other pumps. Head vs. flow test data collected in September 1992 on the Units 1&2 LPSW pumps indicated differences in developed head of up to five percent at a given flowrate.

Interaction between running LPSW pumps is possible whenever the total demand from system loads is minimized. This occurs when a unit is defueled during the winter months. The demand for LPSW cooling from an individual load is typically minimized during the winter while a defueled unit reduces the number of loads on the system. This is the configuration that existed during the February 1992 event.

On Units 1&2, if worse case assumptions are made to maximize the difference in developed head between the LPSW pumps and to minimize total system loads, the potential exists for the stronger pump to close the weaker pump's discharge valve and keep it closed. The weaker pump would then be exposed to extended dead-head conditions. Procedural guidance has now been developed to ensure LPSW flow will be maintained >4,000 gpm on the shutdown unit whenever either Unit 1 or Unit 2 is shutdown in refueling. These procedures further require that if this flowrate cannot be maintained on the shutdown unit, then LPSW system must be reduced to one pump operation. Procedures for cold shutdown conditions also have been changed to alert operators of a potential deadhead condition that may develop. Engineering studies are continuing to determine if and/or when it may be necessary to isolate one LPSW pump on Units 1 and 2 when either unit is in a refueling outage. This will have to address both low flow conditions as well as ES flow requirements for the operating unit. These current requirements as well as any future actions resulting from the engineering studies should be sufficient to maintain LPSW pumps above their recommended MCF, even if a difference in developed head of approximately 10 percent exists between the two pumps. Even if one of the two pumps does not remain above its recommended MCF, the potential effect of accelerated wear could affect service life but would not be an immediate failure concern. Total system loads are high enough that neither pump would experience extended dead-head conditions.

As documented in NRC Inspection Reports 50-269/92-09, 50-270/92-09, and 50-287/92-09, Unit 3 procedure had previously been revised to prevent operating two pumps in parallel during low flow conditions. Additional procedure changes have been made to require the LPSW system to be shutdown if flow cannot be maintained >4,000 gpm.

It is not necessary to install minimum flow bypass line for the LPSW pumps. This is based on almost 100 pump-years of operating experience, the acceptable test data produced by regular IWP performance testing, and the acceptable results of various pump inspection and maintenance activities. Current guidance and practice is sufficient to ensure that there will be no pump damage from low flow operation.

Should you have further questions, please feel free to contact M.E. Patrick at (803) 885-3292.

Very truly yours,

J. W. Hampton
Vice President

TDP/tdp

J. W. Hampton, being duly sworn, states that he is Site Vice President of Duke Power Company, that he is authorized on the part of said Company to sign and file with the Nuclear Regulatory Commission this revision to the Oconee Nuclear Station License Nos. DPR-38, DPR-47, and DPR-55; and that all statements and matters set forth therein are true and correct to the best of his knowledge.

J. W. Hampton, Vice President

Subscribed and sworn to before me this 7 day of January, 1993.

Notary Public

My Commission Expires:

March 21, 1993

xc:

Mr. S. D. Ebneter, Regional Administrator
US Nuclear Regulatory Commission, Region II
101 Marietta Street, NW Suite 2900
Atlanta, GA 30323

Mr. L. A. Wiens, Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 9H3
Washington, DC 20555

Mr. P. E. Harmon
NRC Senior Resident Inspector
Oconee Nuclear Site