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SUBJECT: Responds to NRC Bulletin 88-004, "Potential Safety-Related Pump loss."

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FPL

P.O. Box 14000, Juno Beach, FL 33408-0420

JUNE 16 1989

L-89-192

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

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
NRC Bulletin 88-04
Potential Safety-Related Pump Loss

NRC Bulletin 88-04 "Potential Safety-Related Pump Loss", issued May 5, 1988, requested that all licensees investigate and correct, as applicable, two miniflow design concerns. The first concern involves the potential for the dead-heading of one or more pumps in safety-related systems that have a miniflow line common to two or more pumps or other piping configurations that do not preclude pump-to-pump interaction during miniflow operation. A second concern is whether or not the installed miniflow capacity is adequate for even a single pump in operation.

By letter dated July 18, 1988 (FPL letter No. L-88-295) Florida Power & Light Company provided an interim response to the bulletin pending receipt of the results of hydraulic instability calculations by the respective safety-related pump manufacturers.

The attached information completes our response to NRC Bulletin 88-04.

Should there be any questions, please contact us.

Very truly yours,

C. O. Woody
Acting Senior Vice President - Nuclear

COW/TCG/gp

Attachment

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

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STATE OF FLORIDA)
) ss.
COUNTY OF PALM BEACH)

C. O. Woody being first duly sworn, deposes and says:

That he is Acting Senior Vice President - Nuclear, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

C. O. Woody

Subscribed and sworn to before me this 16th day of June, 1989.

NOTARY PUBLIC, in and for the County of Palm Beach, State of Florida

NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXP SEPT 18,1989
BONDED THRU GENERAL INS. UND.

My Commission expires

ATTACHMENT

Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
NRC Bulletin 88-04
Potential Safety-Related Pump Loss

I. BACKGROUND

As a result of a notification by Westinghouse Electric Corporation, the NRC issued IE Notice 87-59 "Potential RHR Pump Loss". This IE notice identified the potential for dead heading a safety related pump when two centrifugal pumps are operated through a common recirculation line. In this case, if RCS pressure is above RHR pump shutoff head, then both pumps will be operating solely in recirculation through the common mini-flow line. If one pump is "stronger" than the other, the "weaker" pump could be dead headed, resulting in eventual pump damage. This notice also identified as a second concern that the subject mini-flow line may provide less than optimal flows for even single pump operation, which may result in hydraulic instability.

Because the above concerns are potentially generic in nature, the NRC staff developed and issued NRC Bulletin 88-04, "Potential Safety-Related Pump Loss" which requested that all licensees address the two miniflow design concerns. Florida Power & Light Company (FPL) provided an interim response to NRC Bulletin 88-04 by letter L-88-295 dated July 18, 1988. The response addressed the dead heading concern for the SI, RHR, AFW and CS pumps. The interim response indicated that the piping configurations at Turkey Point Units 3 & 4 preclude dead heading in most cases. The above conclusion was based on calculations using actual measured pump performance curves, worst case alignment, and conservative assumptions. FPL also concluded that the Boric Acid Transfer Pumps (BATP) could potentially be dead headed since more than one BATP could be aligned through the same recirculation orifice. The Operations staff at Turkey Point was notified of this problem and administrative controls were implemented to preclude this scenario.

FPL contacted the various pump vendors to provide information on the acceptability of the current minimum flowrates. Traditionally, the minimum flow specified by pump manufacturers had been determined solely by heat removal considerations. This type of minimum flow rate did not consider the possibility of internal recirculation and hydraulic instability which can be present at low flows. The following evaluation addresses the adequacy of current operating scenarios with respect to the information provided to FPL by the various pump manufacturers for the subject safety related pumps. This submittal completes our response to IEB 88-04.

II. EVALUATION

II.A HYDRAULIC INSTABILITY

Safety Injection Pumps

The Safety Injection Pumps at Turkey Point are equipped with 30 gpm minimum flow capability. Additionally, a full flow test line (300 gpm) is provided for surveillance testing to limit the amount of time on minimum flow. The pump manufacturer (Worthington, Dresser Pump Division) had conservatively estimated the minimum flow for continuous operation to be 150 gpm. Following this, Westinghouse was contacted to review the minimum flow (30 gpm) with respect to various operating conditions. Westinghouse concluded that the 30 gpm flow rate is acceptable and that the pumps are capable of performing their safety functions without failure due to expected minimum flow operations. The pump manufacturer has reviewed and accepted the methodology utilized by Westinghouse.

Therefore, no plant hardware modifications are required. The current five minute operation limit at the mimimum flow can be extended to 30 minutes per the results of the Westinghouse evaluation. Also, the current IST program at Turkey Point has been reviewed and determined to be acceptable for detection of long term degradation.

Residual Heat Removal (RHR)

The RHR pump vendor was contacted to provide input as to the acceptability of the current minimum continuous flowrate of 300 gpm. Ingersoll-Rand provided FPL with the recommended flowrates for the RHR pump. Ingersoll-Rand concluded that flowrates greater than 100 gpm are acceptable for 30 minutes of operation. This is based on thermal rise considerations. Ingersoll-Rand also provided methods to monitor and assess the effects of hydraulic instability. These methods include monitoring pump vibration and pump performance. A review of the current IST program at Turkey Point indicates that the program is in accordance with the above Ingersoll-Rand recommendations. In addition, pump frequency versus peak velocity information is recorded by the Analytically Based Preventive Maintenance (ABPM) group at Turkey Point. A review of this information shows that no pump degradation (i.e. a trending of vibrational increases) has occurred.

Ingersoll-Rand also provided a method to calculate service interval based on inputs such as number of starts and stops, amount of time per year above minimum continuous flow, and amount of time below minimum continuous flow. A review of the Ingersoll-Rand methodology shows that, on an annual basis,

running the RHR pumps at full flow reduces the service interval by a greater amount than operation on minimum flow. (The service interval is defined by Ingersoll-Rand to be the remaining pump operating life before servicing is required.) This is because the amount of time on full flow each year is much greater than the amount of time spent on minimum recirculation. The above conclusion is based on an estimate of operating times on full flow and minimum recirculation flowrates. Therefore, the effect on the RHR pump service interval is not significantly affected by operation at the current 300 gpm minimum flowrate.

The above considerations provide assurance that the 300 gpm minimum continuous flowrate at Turkey Point is acceptable and that no hardware modifications are necessary.

Containment Spray Pumps (CS)

The containment spray pumps have both a test recirculation line (400 gpm) and a minimum recirculation line (50 gpm). Both of these lines are discussed below.

In our July 18, 1988 response, it was concluded that the designed dedicated recirculation (400 gpm) test lines were adequate for stable operation based on information provided from the vendor. At that time Unit 3 construction was complete, and the completion of the Unit 4 recirculation line was pending installation of the correct valve trim. The construction for Unit 4 is now complete.

As noted above, the minimum recirculation line is sized for only 50 gpm; but the pump will operate in this mode only during the stroke time for the CS pump discharge valve (MOV-880). The amount of time the pump would be at the 50 gpm flow would only be equal to the time required for MOV-880 to open, which is a relatively short period of time (about six seconds according to the Westinghouse valve data sheet).

The IST procedures for the CS pumps were reviewed and they preclude operation of the pumps during testing solely on the 50 gpm recirculation lines.

Since the vendor has stated that 50 gpm is adequate to address thermal concerns and the amount of time at minimum recirculation is small, the effects on operation of the CS pump at 50 gpm is negligible. Therefore, the configuration at Turkey Point is acceptable with respect to hydraulic instability.

Auxiliary Feedwater Pumps (AFW)

The minimum circulation lines for the AFW pumps provide 10 gpm flowback to the CST. An additional 30 gpm is routed from the pump's second stage to the respective lube oil coolers. Ingersoll-Rand provided FPL with the recommended flowrates for

the subject pump. Ingersoll-Rand concluded that a minimum flowrate of 10 gpm is acceptable for 30 minutes if the pump is properly monitored for excessive wear.

A review of procedures and drawings indicates that the amount of time at minimum flow will be much less than 30 minutes.

A review of the IST program also shows that the AFW pumps are monitored in accordance with Ingersoll-Rand requirements.

The above considerations provide assurance that the 10 gpm minimum flowrate for the AFW pumps is acceptable and no hardware modifications are required.

Boric Acid Transfer Pumps (BATP)

The BATPs require a minimum of 22 gpm of flow per the vendor manual, however the minimum recirculation flowrate at Turkey Point is approximately 15 gpm. This condition was analyzed by Goulds Pump and determined to be acceptable.

The IST Program has been reviewed and determined to be adequate to detect pump degradation.

II.B DEAD HEADING

Boric Acid Transfer Pumps (BATP)

In our July 18, 1988 response, the BATPs were identified as having a potential for dead heading since the configuration at Turkey Point allows alignment such that more than one pump can operate through a single minimum recirculation orifice. Potential long term solutions were reviewed and it was concluded that the administrative controls implemented previously, adequately prevent a condition where dead heading potentially could occur. The operating procedures were reviewed to ensure that they have been revised to incorporate steps or precautionary statements to preclude a condition as described in NRC Bulletin 88-04 as being indicative of dead heading.

III. Conclusion

The requirements of NRC Bulletin 88-04 have been satisfactorily addressed for Turkey Point Units 3 & 4. No hardware modifications are required. No further procedure modifications are required.