



## LONG ISLAND LIGHTING COMPANY

SHOREHAM NUCLEAR POWER STATION • P.O. BOX 628 • WADING RIVER, NEW YORK 11792

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JUL 08 1988

SNRC-1473

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

NRC Bulletin No. 88-04  
Potential Safety-Related Pump Loss  
Shoreham Nuclear Power Station - Unit 1  
Docket No. 50-322

Gentlemen:

The Long Island Lighting Company has reviewed and applied the concerns expressed in Bulletin 88-04 and NRC Information Notice 87-59, Potential RHR Pump Loss, to the appropriate safety-related systems at the Shoreham Nuclear Power Station (SNPS). Based upon this review, we concluded that the Core Spray (CS) and Residual Heat Removal (RHR) systems at Shoreham were the only systems to which the Notice and Bulletin are applicable; and that these system designs properly considered these concerns and that pump loss will not occur due to the sharing of a common minimum flow discharge line or an insufficient minimum flow capacity.

Bulletin 88-04 requests all licensees to investigate and correct, as applicable, two minimum flow design concerns. The first concern involves the potential for the deadheading of one or more pumps in safety-related systems that have a minimum flow line common to two or more pumps or other piping configurations that do not preclude pump-to-pump interaction during minimum flow operation. The second concern is whether or not the installed minimum flow capacity is adequate for even a single pump in operation.

The first concern addresses the design condition where two or more pumps share a common minimum recirculation discharge header. Slight degradation of one pump in such an arrangement may result in its being deadheaded by the other pump(s). Operation at zero flow can result in the damaging of the deadheaded pump within a short period of time. The second concern addresses insufficient minimum recirculation flow and applies to both one and two pump

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installations. Centrifugal pumps at some point below the best efficiency point (BEP) on their characteristic curves, will demonstrate a flow condition that has been described as hydraulic instability or impeller recirculation. These unsteady flow phenomena become progressively more pronounced as the flow is further decreased and can potentially result in pump damage from vibration and excessive forces caused by cavitation. Additionally, the Bulletin notes that traditional design practice may provide lower minimum recirculation flow rates than are currently required by certain pump manufacturers.

As previously mentioned, LILCO found that the Core Spray and Residual Heat Removal systems are the only safety-related systems where the foregoing concerns could be potentially applicable.

The Shoreham RHR System is comprised of two independent loops with two pumps per loop. Minimum recirculation capability is provided to protect against overheating. The two RHR pumps in either loop operate on minimum recirculation by taking suction from the suppression pool through independent lines, discharging through independent restriction orifices, and returning through the RHR test line that runs from the common discharge header to the suppression pool. The RHR pumps may be operated either alone or in parallel. The Low Pressure Coolant Injection (LPCI) mode of RHR is designed to provide coolant to the reactor vessel under emergency conditions and may be initiated either automatically or by operator action. Upon LPCI initiation, the RHR pumps will operate with an open minimum recirculation path until sufficient flow has been established and the reactor vessel pressure drops to less than the pump shutoff head at which time the minimum flow line is isolated. LPCI injection to the vessel will follow.

The possibility for deadheading one of these pumps (RHR) operating on this common discharge header was considered. The pressure drop across each individual pump's discharge orifice was determined to be sufficient to preclude deadheading of the parallel pump. This statement is supported by test data which indicates that a minimum of 20 ft. of pump differential head exists between shut off and minimum flow conditions. Since the pressure drop is controlled by the orifice, any variation in pipe line loss would have negligible effect on pump head requirements.

The Core Spray System was included in our investigation because, at Shoreham, the minimum flow line (3") for each Core Spray pump ties into separate 16 inch RHR test return lines which discharge to the suppression pool. The possibility of deadheading a Core Spray pump was considered. The 16" RHR line offers essentially no system resistance to the Core Spray minimum flow and therefore no hydraulic interaction is feasible and thus the Core Spray minimum flow is independent of RHR pump operation.

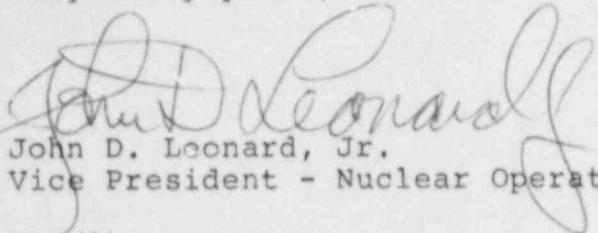
The possibility for insufficient minimum recirculation flow was examined. Our review of Shoreham's design of the RHR and CS systems indicates that a required nominal 10% of rated flow was

used to size the minimum recirculation discharge orifices. Field experience at SNPS and other Boiling Water Reactors (BWRs) with Byron-Jackson pumps supports that this minimum flow condition is sufficient to preclude overheating.

Preliminary BWR Owners Group investigation of the concerns addressed by Bulletin 88-04 supports the information stated above.

If you should require additional information or clarification regarding this matter, please do not hesitate to contact me.

Very truly yours,



John D. Leonard, Jr.  
Vice President - Nuclear Operations

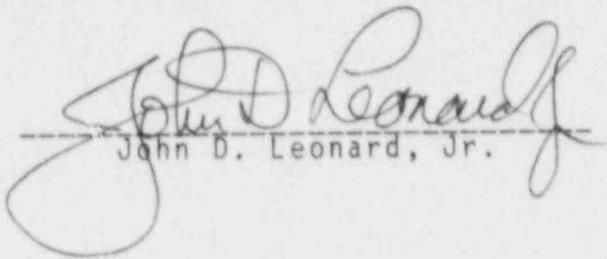
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cc: W. T. Russell - Region I  
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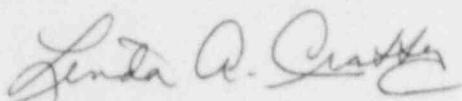
STATE OF NEW YORK )  
COUNTY OF SUFFOLK )        ss:

I, JOHN D. LEONARD, JR., being duly sworn, depose and say that I am the Vice President - Nuclear Operations for the Long Island Lighting Company. I am authorized on the part of said Company to sign and file with the U.S. Nuclear Regulatory Commission the enclosed letter (SNRC-1473) for the Shoreham Nuclear Power Station. This response was prepared under my supervision and direction; and the statements contained therein are true and correct to the best of my knowledge, information and belief.



John D. Leonard, Jr.

Sworn to before me this  
8 day of July 1988



LINDA A. CRATTY  
NOTARY PUBLIC, State of New York  
No. 4816267  
Qualified in Suffolk County  
Commission Expires March 30, 1920