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September 21, 1989

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

SUBJECT: Supplemental Response to NRC Bulletin No. 88-04: Potential Safety Related Pump Loss

REFERENCE: Consolidated Edison Letter to NRC dated July 19, 1988

This letter supplements our July 19, 1988 response to the subject Bulletin. In that letter, we indicated that minimum flow concerns with respect to the Indian Point Unit 2 auxiliary feedwater system pumps required further evaluation. The evaluations have been completed and are provided as follows:

Motor Driven Auxiliary Feedwater Pumps 21 & 23

For these pumps the referenced July 19, 1988 letter contains a partial response to the minimum flow concerns outlined in the subject Bulletin (i.e., low flow operation of the motor driven auxiliary feedwater pumps during both plant shutdown and testing meets manufacturer's recommendations for these specific conditions). A third low flow operating mode for the motor driven auxiliary feedwater pumps is that which provides Condensate Storage Tank (CST) freeze protection via pump heat and flow induced mixing during prolonged winter shutdowns. With a motor driven auxiliary feedwater pump operating and the main flowpath isolated, recirculation back to the CST provides a source of both heat and flow in sufficient quantities to protect the tank inventory from freezing. In previous years, when using the pumps in this mode, the recirculation flow has been adjusted to 125 gpm (31% rated flow) for each pump using high pressure drop valves. Because this mode of low flow pump operation is continuous, we requested the manufacturer to evaluate the potential detrimental effects (cavitation damage, noise, vibration wear and bearing and shaft failure), and to establish an optimum flow rate for safe, continuous low flow pump operation. The manufacturer, Ingersoll-Rand (I-R) completed the evaluation and provided a recommended minimum continuous flow (MCF) of 150 gpm for each pump. Continuous flow is defined by I-R to be any pump operation exceeding a 3 hour duration in a 24 hour time period. Operation of a pump below its recommended continuous flow rating has a time dependent cumulative effect on the

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overall useful life before repair or replacement parts will be required. The limitation on hours for operation below MCF was conservatively estimated by I-R based on empirical data of vibration at low flow rates, correlated to radial load estimates for steady and unsteady forces, and shaft deflection. From this evaluation methodology, I-R provided a recommended maximum 1000 hours below MCF as the practical operational limit prior to servicing. At IP-2, the total cumulative time of operation below MCF is below the 1000 hours mark established by the pump manufacturer. However, in order to preclude the potential for accelerated wear of the motor driven auxiliary feedwater pumps due to continuous low flow operation, we have adopted the manufacturer's recommended minimum continuous flow of 150 gpm for the CST freeze protection operational mode.

Turbine Driven Auxiliary Feedwater Pump 22

The turbine driven auxiliary feedwater pump is a 100% capacity backup to the two motor driven AFW pumps. The pump discharge is equipped with a continuous recirculation flowpath back to the CST. The recirculation line contains a fixed bypass orifice that is sized to pass 15 percent of the pump's rated capacity at all turbine/pump speeds (140 gpm at full speed to 54 gpm at minimum speed). Upon receipt of an automatic start signal, the turbine will start and run at idle (minimum) speed. The pump itself will only operate on recirculation flow since the auxiliary feedwater regulating valves in its discharge are normally closed and do not receive automatic signals. If not required for the shutdown, due to availability of the preferred motor driven pumps, the turbine driven pump will be manually tripped. This action however, is not an immediate priority and could take up to several hours to accomplish.

The recirculation line is also the flowpath used for periodic inservice testing. In this mode the turbine/pump is run at full speed at minimum flow with the main flowpath isolated. The duration of the quarterly inservice testing is approximately 30 minutes.

The two low flow operating conditions described above have been evaluated by Dresser Pump Division, manufacturer of the turbine driven pump, and were found to be acceptable. Dresser has defined the above pump operating conditions to be intermittent. Their experience indicates that minimum flow requirements for intermittent operation (less than 10 hours per month) is considerably lower than continuous operation (more than 2 hours per day). According to Dresser, the damage caused by low flow operation is not immediate but cumulative in nature, and therefore we and they are confident that the minimum flow originally specified will provide adequate protection against damage as long as the duration of operation at low flow does not exceed 10 hours per month.

This supplemental response is provided pursuant to the provisions of Section 182a, Atomic Energy Act of 1954 as amended. If you or your staff should have any questions regarding this subject, please contact Mr. Jude G. Del Percio, Manager, Nuclear Safety and Licensing.

Very truly yours,

Subscribed and sworn to
before me this 21st day
of September, 1989.

Karen L. Lancaster
Notary Public

KAREN L. LANCASTER
Notary Public, State of New York
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