

Docket



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 6, 1988

Docket No. 50-482

Mr. Bart D. Withers
President and Chief Executive Officer
Wolf Creek Nuclear Operating Corporation
Post Office Box 411
Burlington, Kansas 66839

Dear Mr. Withers:

SUBJECT: THE IMPACT OF PROLONGED LOW POWER OPERATION
ON THE RELIABILITY OF CHECK VALVES

Reference: Letter from M. O. Medford to NRC, "Investigation
Report, San Onofre Unit 1 Water Hammer Event of
November 21, 1985," dated April, 1986.

Check valves are used in many systems important to plant safety and reliability. Failure of check valves can lead to overpressurization of low-pressure systems, water hammer, steam binding, and extensive damage to other components at nuclear power plants.

Recent industry experience showed that accelerated wear and failure of certain check valves could occur due to continued undesirable flow operations. The primary cause of this premature degradation is continuous fluctuation of the check valve disc when it is not firmly held against the backstop by the fluid forces pushing on it. The position of the check valve disc can be determined by a balance of fluid lifting force and the gravitational force acting on the disc and hinge arm weights. Low flow velocities are not sufficient to lift the disc through its full stroke and hold it firmly in a stable position against a stop. With each minor flow pulsation, the disc then fluctuates causing premature wear of moving parts. This instability if coupled with close proximity upstream flow disturbance such as elbows, tees, control valves and pumps could cause rapid wear and in some cases even failure of the valves.

An analysis (Reference 1) was performed to identify the root causes of check valve failures during the November 21, 1985, water hammer event at San Onofre Nuclear Generation Station, Unit 1. That analysis concluded that the failure of the five failed check valves was caused by repeated hammering of the disc stud and the stud nut against the backstop due to insufficient disc lifting force of the low flow rate during reduced power operation. The plant had been operating at reduced power and the reduced feedwater flow, coupled with a high level of turbulence due to increased throttling of the flow control valve, resulted in an amplified oscillation and accelerated degradation. Eventually it led to failures of the check valves.

Based on the above discussion, it is reasonable to conclude that certain check valves are vulnerable to damage caused by prolonged reduced flow operation.

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Mr. Bart D. Withers

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Therefore, I am advising you of this concern and requesting that you review your plant configuration for possible impact of prolonged low flow operation on the reliability of check valves.

This letter requires no formal response.

Sincerely,

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Paul W. O'Connor, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects

cc: See next page

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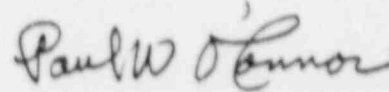
Mr. Bart D. Withers

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Therefore, I am advising you of this concern and requesting that you review your plant configuration for possible impact of prolonged low flow operation on the reliability of check valves.

This letter requires no formal response.

Sincerely,

A handwritten signature in cursive script, reading "Paul W O'Connor".

Paul W. O'Connor, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects

cc: See next page

Mr. Bart D. Withers
Wolf Creek Nuclear Operating Corporation

Wolf Creek Generating Station
Unit No. 1

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