

Docket Files

SEP 02 1977

Docket No. 50-305

Wisconsin Public Service Corporation  
ATTN: Mr. E. W. James  
Senior Vice President  
Post Office Box 1200  
Green Bay, Wisconsin 54305

Gentlemen:

RE: KEWAUNEE NUCLEAR POWER PLANT

The NRC staff continually reviews experience from operating reactors to assure that an adequate level of safety is maintained at each individual nuclear plant and for the total population of nuclear plants. As new technical information and operating experience becomes available, the NRC evaluates whether such information could significantly alter the previously determined levels of safety. In this regard, we have noted that there have been about 50 reported water hammer events in light water reactors some of which resulted in structural damage to safety significant systems. Of these, approximately 20 water hammers have occurred due to the rapid condensation of steam in feedwater lines in plants with Westinghouse and Combustion Engineering designed steam generators. While for the most part damage from these events has been limited to piping supports, one event in the feedwater line of a pressurized water reactor did result in a significant piping failure. None of the events to date has resulted in an adverse impact on the health and safety of the public. It is possible, however, that water hammers could lead to more severe consequences; although it would be expected that the probability of such events is very low.

Because of the continuing occurrence of water hammer events, the NRC staff has been evaluating available operating experience, actively discussing with nuclear steam supply vendors and architect/engineering firms ways of reducing the frequency and consequences of such events, and utilizing technical consultants to more definitely examine water hammer phenomena. A copy of the report of our principal consultant, CREARE, is attached (Enclosure 1) for your information.

As a result of our efforts to date, we believe that water hammers due to the rapid condensation of steam in the feedwater lines of steam generators represent a safety concern and that further actions by licensees are

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warranted to assure that an acceptably low risk to public safety due to such events is maintained. The staff has concluded that such assurance would be provided if it can be demonstrated that the feedwater lines and feedwater spargers would remain sufficiently filled with water to preclude water hammer under normal and transient operating conditions. Accordingly, you are requested to submit within 120 days of the date of this letter, the following information:

- (1) Proposed plant design and/or procedural modifications, if any, which are necessary to assure that the feedwater lines and spargers remain filled with water during normal as well as transient operating conditions. Supporting evaluations and analyses, and any necessary procedural testing, should be provided to demonstrate the system performance. We recognize that there may be various design and/or procedural options available which will satisfy this objective and that, in some cases, existing plant designs may already incorporate such provisions. For example, we believe that provisions such as the use of top discharge feedwater spargers, and automatically initiated operation of auxiliary feedwater systems, could maintain the feedwater lines and sparger full of water. In addition, it appears that steam generator feedwater system design characteristics may, in some cases, inherently maintain a filled status by virtue of the elevation of the sparger, the closure rate of the feedwater control valve, prompt availability of auxiliary feedwater, etc. Proposed modifications will be reviewed and approved on the basis of their effectiveness to reliably maintain the feedwater lines and spargers filled with water on a plant specific basis.
- (2) An assessment of your proposed design and procedural modifications in terms of the impact or interaction with the safety design bases and supporting safety analyses for the plant.
- (3) A schedule for implementation of the proposed design and procedural modifications.

While existing Technical Specifications contain reporting requirements applicable to water hammers, the staff has developed additional guidance regarding the type of events to be reported. Specifically, all future damaging water hammer events occurring in safety-related systems or

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occurring in other systems that affect safety-related systems should be reported. A format for the reports is enclosed. Damaging water hammer events are those events that result in: (a) damage to pipe supports or pipe insulation, (b) pipe displacement, or (c) failure of pipes or components.

Approved by GAO, B-180225 (R0072), clearance expires July 31, 1980. Approval was given under a blanket clearance specifically for identified generic problems.

Sincerely,

A. Schwencer, Chief  
 Operating Reactors Branch #1  
 Division of Operating Reactors

Enclosures:

1. Report by CREARE on  
 Water Hammer Phenomena NUREG-0291
2. Format for Report

cc w/o enclosures:  
 See next page

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cc: Steven E. Keane, Esquire  
Foley, Sammond & Lardner  
735 North Water Street  
Milwaukee, Wisconsin 53202

Bruce W. Churchill, Esquire  
Shaw, Pittman, Potts & Trowbridge  
1800 M Street, NW.  
Washington, D. C. 20036

Kewaunee Public Library  
314 Milwaukee Street  
Kewaunee, Wisconsin 54216

Report of Water Hammer

Plant Name and Unit No. \_\_\_\_\_

Date and Time of Occurrence \_\_\_\_\_ Operational Mode \_\_\_\_\_

Plant Systems Affected:

Reactor Coolant \_\_\_\_\_

RHR \_\_\_\_\_

ECCS \_\_\_\_\_

Main Steam \_\_\_\_\_

Main Feedwater \_\_\_\_\_

Other Systems \_\_\_\_\_

Aux. Feedwater \_\_\_\_\_

Containment Spray \_\_\_\_\_

Component Cooling \_\_\_\_\_

Service Water \_\_\_\_\_

Cause of Water Hammer

Rapid Condensation \_\_\_\_\_

Voided Pipe \_\_\_\_\_

Water Entrainment \_\_\_\_\_

Other \_\_\_\_\_

Pump Start \_\_\_\_\_

Rapid Valve Motion \_\_\_\_\_

Operator Error \_\_\_\_\_

Instrument readings and other observations that indicate the probable cause and effects of the water hammer:

Description of Damage:

Corrective Action:

WISCONSIN PUBLIC SERVICE CORPORATION



P.O. Box 1200, Green Bay, Wisconsin 54305

September 1, 1977

Mr. James M. Allen, Chief  
Fuels Facility and Materials Safety Branch  
Office of Inspection & Enforcement  
Region III  
U. S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Dear Sir:

Subject: Docket 50-305  
Operating License DPR-43  
Kewaunee Emergency Plan

A revised Kewaunee Emergency Plan has been drafted and is currently being reviewed. Several problems have been encountered in making the plan compatible with the revised Security Plan and other State and Federal Regulations. Due to these complications, it is taking longer to implement the revised plan than initially forecast. We do expect to complete this task shortly, hopefully within 30 days.

Very truly yours,

*E. W. James*

E. W. James  
Senior Vice President  
Power Supply & Engineering

EWJ:sna

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