September 16, 1982

Docket No. 50-155
LS05-82-09-052

Mr. David J. VandeWalle
Nuclear Licensing Administrator
Consumers Power Company
1945 W. Parnall Road
Jackson, Michigan 49201

Dear Mr. VandeWalle:

SUBJECT: SEP TOPIC III-5.B, PIPE BREAK OUTSIDE CONTAINMENT
BIG ROCK POINT NUCLEAR POWER PLANT

By letter dated May 21, 1982, you submitted a safety assessment report on this topic. The staff has reviewed this assessment and our conclusions are presented in the enclosed safety evaluation report, which completes this topic for the Big Rock Point Nuclear Power Plant.

As noted in the evaluation, it is the staff's position that adequate protection should be provided to prevent redundant trains of safety-related equipment from being disabled by postulated piping failures in the screen house. The need to actually implement changes as a result of these positions will be addressed in the Integrated Assessment.

The enclosed safety evaluation will be a basic input to the Integrated Safety Assessment for your facility. The evaluation may be revised in the future if your facility design is changed or if NRC criteria relating to this topic are modified before the Integrated Assessment is completed.

SEQ4
DSU USE(18)

Sincerely,

ADD:
G. Staley

Original signed by:

Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
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ORB#5
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*See previous concurrence

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NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

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As stated

cc w/enclosure:
See next page

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OFFICE	SEPB	SEPB	SEPB	SEPB	SEPB	ORB#	ORB#
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NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

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SYSTEMATIC EVALUATION PROGRAM

TOPIC III-5.B

BIG ROCK POINT NUCLEAR POWER PLANT

TOPIC: III-5.B, Pipe Break Outside Containment

I. INTRODUCTION

The safety objective of Systematic Evaluation Program (SEP) Topic III-5.B, "Pipe Break Outside Containment," is to assure that pipe breaks would not cause the loss of required function of "safety-related" structures, systems and components and to assure that the plant can be safely shutdown in the event of such breaks. The required functions of safety-related systems are those functions required to mitigate the effects of the pipe break and safely shutdown the reactor plant.

II. REVIEW CRITERIA

General Design Criteria 4 (Appendix A to 10 CFR Part 50) requires in part that structures, systems and components important to safety be appropriately protected against dynamic effects, such as pipe whip and discharging fluids, that may result from equipment failures.

III. RELATED SAFETY TOPICS AND INTERFACES

1. This review complements that of SEP Topic VII-3, "Systems Required for Safe Shutdown."

2. The environmental effects of pressure, temperature, humidity and flooding due to postulated pipe breaks are evaluated under Unresolved Safety Issue A-24, "Qualification of Class 1E Safety-Related Equipment."

3. The effects of potential missiles generated by fluid system ruptures and rotating machinery were also considered and are evaluated under SEP Topic III-4.C, "Internally Generated Missiles."

4. The original plant design in the areas of seismic input, analysis and design criteria are evaluated under SEP Topic III-6, "Seismic Design Considerations."

IV. REVIEW GUIDELINES

The current criteria for review of pipe breaks outside containment are contained in Standard Review Plan 3.6.1, "Postulated Piping Failures in Fluid Systems Outside of Containment," including its attached Branch Technical Position, Auxiliary System Branch 3-1 (BTP ASB 3-1) and Standard Review Plan 3.6.2, "Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," including its attached Branch Technical Position, Mechanical Engineering Branch 3-1 (BTP MEB 3-1).

The licensee's break location criteria and methods of analysis for evaluating postulated breaks in high energy piping systems outside containment have been compared with the currently accepted review criteria as described in Section II above. The review relied upon information submitted by the licensee Consumers Power Company (CPCo), in References 1, 2 and 3.

The scope of review under this topic was limited to avoid duplication of effort since some aspects of the topic were previously reivewed by the staff or are included under other SEP topic (see III above).

When differences from the review criteria are identified, engineering judgement is utilized to evaluate the consequences of postulated pipe breaks to assure that the pipe break would not cause the loss of the required functions of "safety-related" systems, structures and components and to assure that the plant can be safely shutdown in the event of such a break.

V. EVALUATION

A. BACKGROUND

In December 1972, the staff sent letters (Reference 4) to all power reactor licensees requesting an analysis of the effects of postulated failures of high energy lines outside of containment. In response to our letter, the licensee submitted Reference 1, which transmitted results of compartment pressurization, and jet thrust and pipe whip evaluations. In Reference 5, the staff issued Amendment No. 8 to Facility License No. DPR-6, which approved the licensee's program including facility modifications and the augmented inservice inspection programs of selected locations for which modifications were impractical. The main steam and main feedwater piping from the containment penetration to the isolation valve was covered by the inspection program.

High energy piping systems were considered in the 1973 analysis. Under current criteria, the effects of failure of moderate-energy lines should also be addressed. The licensee's SEP reevaluation of pipe break outside containment (Reference 2), therefore, includes the following:

1. A comparison of the criteria used in the previous evaluation with current high energy line break (HELB) criteria.

2. Evaluation of the effects of failure of moderate-energy piping.

B. COMPARISON OF CRITERIA

A review of the criteria used in Reference 1 versus the currently accepted review criteria described in Section II shows that the criteria used in Reference 1 is the same as current criteria except as follows:

The 1973 evaluation defined a high-energy line as one with temperature ≥ 200°F and pressure ≥ 275 psig. Current criteria defines a high-energy line as one with temperature ≥ 200°F or pressure ≥ 275 psig. A moderate-energy line is one in which temperature is less than 200°F and pressure is less than 275 psig.

With this change in HELB definition one line not previously evaluated is defined as a high-energy line, the heating steam system. As discussed above, through-wall leakage cracks in moderate-energy lines must also be evaluated.

C. EFFECTS OF PIPING FAILURE

1. Heating Steam Line

The heating steam line is routed through the electrical equipment room above safety-related motor control centers and cable trays. The tops of the cabinets are protected with splash covers.

The ability to shutdown with the emergency condenser is not dependent upon the availability of any equipment in the electrical equipment room. An assumed single failure of a dc bus could disable emergency condenser operation. However, the reactor depressurization system (RDS) and core spray (fire water) systems would still be available. The physical separation of this equipment is such that a single break of the heating steam could not prevent one train from operating. Therefore, these interactions are considered acceptable.

2. Moderate-Energy Piping Cracks

Several areas in the plant contain safety-related equipment and moderate-energy lines. In most locations there exist drainage paths, splash covers, routine inspections and pump auto start alarms to mitigate the effects of the leak.

Two areas were identified as being potentially vulnerable to flooding. Breaks in fire protection piping in the core spray pump room could affect operation of the core spray pumps since the pump motor casings are not splash-proof. A drainage line is provided; in addition, the postulated leak flow rate would be sufficient to result in starting of the fire water pump, which alarms in the control room. The equipment in the core spray room is used for recirculation of ECCS (fire protection system) and is not required for safety shutdown. Since the postulated piping failure would not cause a reactor/turbine trip, loss of offsite power need not be postulated. The piping failure does not initiate an event for which ECCS is needed. Therefore, adequate protection is provided for the core spray room.

The screen house contains several pumps and associated piping. Flooding due to a failure in the fire system, the service water system or the circulating water system, could result in submergence of the fire pumps. Spray from such breaks could also affect pumps in the screen house.

The emergency condenser could be used for shutdown, with makeup from either the demineralized water system, or the fire water system (if at least one fire pump is unaffected).

The fire pumps have several safety functions at the Big Rock Point plant. Accordingly, the potential to damage both pumps due to flooding should be eliminated. The licensee should ensure that a postulated moderate-energy leakage crack will not disable both fire system pumps.

VI. CONCLUSION

Based on previous staff reviews and the above discussion, the staff concludes that the plant is adequately protected from dynamic effects of pipe failure outside containment subject to resolution of flooding from postulated leaks in the screen house.

VII. REFERENCES

1. Letter G.J. Walke (Consumers Power Co.) to J.F. O'Leary (AEC), June 29, 1973.

2. Letter, R.A. Vincent (Consumers Power Co.) to D.M. Crutchfield (NRC), May 21, 1982.

3. Letter, Consumers Power Co. to AEC, February 7, 1974.

4. Letter, A. Giambusso (AEC) to Consumers Power Co., December 18, 1972.

5. Amerdment No. 8 to Facility License No. DPR-6, including Change No. 45 to the Technical Specifications, November 5, 1974.