December 30, 1982

Docket No. 50-155
LS05-82-12-062

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

Dear Mr. VandeWalle:

SUBJECT: SEP TOPIC V-4, PIPING AND SAFE-END INTEGRITY
BIG ROCK POINT NUCLEAR POWER PLANT

Reference: Letter from D. J. VandeWalle (CPCo) to D. M. Crutchfield (NRC), "Furnace Sensitized Stainless Steel Safe-Ends," dated May 28, 1982.

Enclosed is a copy of our final evaluation of SEP Topic V-4 for Big Rock Point. This assessment was based on a comparison of the facility, as described in Docket No. 50-155, and the information in the letter referenced above, with the criteria currently used by the regulatory staff for reviewing facilities with sensitized austenitic stainless steel safe-ends.

This evaluation will be a basic input to the integrated safey assessment for your facility unless you identify changes needed to reflect the as-built conditions at your facility. This assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this subject are modified before the integrated assessment is completed.

Sincerely,

SE04

Original signed by:

DSH USE (18)

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

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Enclosure:
As stated

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See next page

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DATE	12/28/82	12/28/82	12/28/82	12/29/82	12/30/82	12/30/82	

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

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SYSTEMATIC EVALUATION PROGRAM

TOPIC V-4

BIG ROCK POINT NUCLEAR POWER PLANT

TOPIC: V-4, Piping and Safe-End Integrity

I. INTRODUCTION

During component fabrication and plant construction, parts of the reactor coolant pressure boundary that are made of austenitic stainless steel may have been sensitized. Sensitization of the austenitic stainless steel, together with an applied stress and a corrosive environment, will lead to intergranular stress corrosion cracking and may eventually lead to the failure of a system or component to perform its safety function, or a pipe break resulting in a loss of coolant accident.

The objective of Topic V-4 is to ensure continued piping integrity and compliance with the regulations in 10 CFR Part 50. This objective was to be met through the review of the safety aspects that affect BWR and PWR piping and safe-end integrity, including fracture toughness, flaw evaluation, stress corrosion cracking, and control of materials and welding.

By a letter dated May 7, 1981, from the NRC to all SEP licensees, SEP Topic V-4 was deleted from this program because the evaluation required by Unresolved Safety Issue (USI) A-42, "Pipe Cracks in Boiling Water Reactors," USI A-10, "BWR Feedwater Nozzle Cracking and Control Rod Drive Hydraulics Return Line Nozzle Cracking," and NRR Generic Activity C-7, "PWR Systems Piping," was identical to the evaluation required by Topic V-4. In light of the recurrent nature of intergranular stress corrosion cracking in BWR safe-ends, a letter dated April 26, 1982, from the NRC to Consumers Power Company reopened SEP Topic V-4. However, the SEP review was limited to only the issue of stress corrosion cracking of sensitized stainless steel in BWR safe-ends. The other concerns addressed in Topic V-4 were to be resolved as part of the NRC Generic Issues Program.

II. REVIEW CRITERIA

The acceptance criteria for the integrity of reactor coolant pressure boundary safe-ends are stated in the General Design Criteria of Appendix A, 10 CFR Part 50, Criterion 14, "Reactor Coolant Pressure Boundary," requires an extremely low probability of abnormal leakage, of rapidly propagating failure and of gross rupture. Also, Criterion 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," requires assurance that when stressed the boundary behaves in a nonbrittle manner and that the probability of rapidly propagating fracture is minimized recognizing the uncertainties in determining material properties, stresses and size of flaws.

III. REVIEW GUIDELINES

The current acceptance criteria and guidelines used to determine if BWR reactor coolant pressure boundary safe-ends meet the topic safety objective are those provided in NUREG-0313, Rev. 1, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping."

IV. RELATED SAFETY TOPICS

Topic V-5, "Reactor Coolant Pressure Boundary Leakage Detection," will assure that adequately sensitive systems are available to identify leaks before failures occur. Topic III-5.A, "Effects of Pipe Break on Structures, Systems and Components Inside Containment," will assure that the integrity of structures, systems and components relied upon for safe reactor shutdown or to mitigate the consequences of a postulated pipe break is maintained.

V. EVALUATION

The review guidelines and acceptance criteria for Topic V-4 are found in NUREG-0313, Rev. 1. In summary, the acceptance criteria applicable to sensitized BWR safe-ends are:

1. The affected safe-ends should be modified, to the extent practical, to meet current materials selection requirements;

2. For those affected safe-ends not modified, leak detection systems should be provided that will detect leaks in accordance with Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," and an augmented inservice inspection program capable of detecting flaws in austenitic stainless steel should be implemented.

Big Rock Point was built prior to the staff's realization that BWR safe-ends, sensitized during shop post-weld heat treatments, would have a high susceptibility to intergranular stress corrosion cracking. On May 28, 1982, Consumers Power Company submitted a detailed response to the staff's April 26, 1982, information request. That letter and attachments contain (1) a description of the inaccessibility of the safe-ends for inspections; (2) a request for relief from performing the required inspections; (3) an assessment of the Big Rock Point furnace sensitized safe-ends which includes: (a) a Stress Rule Index Evaluation, (b) a Failure Analysis Diagram Calculation Example, (c) IGSCC Damage Index Calculations; and (d) a Tearing Instability Analysis Example; and (4) a conclusion that IGSCC is not a safety issue at Big Rock Point.

The staff review addressed the practicality of examining the reactor vessel nozzle safe-ends to the requirements of NUREG-0313, Rev. 1, except for the frequency of future inspection and evaluated the proposed examination plan. The frequency of future examinations will be addressed by NUREG-0313, Rev. 2, which is currently under preparation and will be issued in the near future.

The staff has reviewed the accessibility problems which would be encountered in attempting to perform the required examinations on the Big Rock Point reactor vessel nozzle safe-ends. We have determined that it is impractical to meet the examination requirements 100% in all cases and that the proposed examinations for the nonconforming safe-ends (steam outlet, shutdown cooling, poison inlet, and instrument nozzles) are adequate to provide assurance that the primary pressure boundary supported by these safe-ends will remain structurally sound.

The twenty-inch recirculation and core spray nozzle safe-ends have been designated nonconforming and service sensitive. Past experience with similar components at other facilities has shown these safe-ends to be highly susceptible to through-wall cracks. Electrochemical Potentiokinetic Reactivation (EPR) tests performed on Big Rock Point's recirculation inlet nozzle 796-1B indicated that the nozzle is severely sensitized. The staff can only surmise that recirculation inlet nozzle 796-1A is severely sensitized. Because of this and the recent leakage in similar lines at Nine Mile Point, the proposed examination for nozzle 796-1B should be conducted on nozzle 796-1A also. Although access prevents performance of 100% of the required volumetric and surface examination, inspection of approximately one-third of each recirculation inlet nozzle safe-end is sufficient to determine their structural integrity considering length of time the plant has been in service. The recent visual examination (1979) performed on the core spray nozzle (with no indications found) has been determined to be adequate and should be performed again as proposed during the next inspection period.

The aforementioned examinations of those accessible areas of the safe-ends should be performed during the next scheduled plant outage.

VI. CONCLUSION

Pending completion of NUREG-0313, Rev. 2, the staff concludes that the examinations of the Big Rock Point safe-ends as proposed by the licensee and the additional examination of recirculation inlet nozzle 796-1A agreed to by the licensee will provide assurance of the structural integrity of primary pressure boundary. The leakage detection requirements for Big Rock Point will be reviewed under SEP Topic V-5 and the frequency of future inspections is being reviewed generically and will be resolved with the implementation of NUREG-0313, Rev. 2.