



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO STEAM GENERATOR WELD EVALUATIONS

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2.

DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

On December 30, 1994, Northern States Power Company (NSP) submitted for NRC approval its evaluation of flaw indications in steam generator welds from ultrasonic testing (UT) conducted during the refueling outage in the spring of 1994 at the Prairie Island Nuclear Power Plant Unit No. 1. The report indicates that two UT indications exceed the allowable flaw size specified in IWB-3500 of the Section XI of American Society of Mechanical Engineers (ASME) Code and require flaw evaluation using IWB-3610 of the ASME Code. One indication is in the upper shell to dome weld region of the No. 11 steam generator (Unit 1) and the other is in the tubesheet to channel head weld region of the No. 12 steam generator (Unit 1). A supplementary report dated January 31, 1995, evaluated two additional indications in this category: one in the upper shell-cone weld of the No. 12 steam generator and the other in the tubesheet to channel head weld region of the No. 22 steam generator (Unit 2). These examinations were executed to satisfy the third period requirements of the second 10-year interval and the first period requirements of the third 10-year interval in compliance with the 1980 and 1989 Editions of the ASME Code.

On April 24, 1995, the licensee submitted WCAP-13032, Revision 1 (March 1995) (proprietary) and withdrew the version of WCAP-13032 attached to its January 31, 1995, application. The April 24, 1995, submittal also included WCAP-14430, a nonproprietary version of WCAP-13032, Revision 1.

The NRC staff has completed its review. Having characterized the flaws through flaw sizing, NSP used two handbooks by Westinghouse, WCAP-13032, Revision 1, "Handbook on Flaw Evaluation Prairie Island Units 1 and 2 Steam Generator Upper Shell to Dome Weld Region (proprietary)," and WCAP-14166, "Handbook on Flaw Evaluation for Prairie Island Units 1 and 2 Steam Generators and Pressurizer (nonproprietary)," to determine the acceptability of the flaws that exceed the allowable flaw size in IWB-3500. Hence, the staff's review constitutes two parts: (1) the review of the methodology and criteria supporting the flaw evaluation curves in the Westinghouse handbooks for Prairie Island Units 1 and 2 steam generators welds, and (2) the review of the licensee's application of these handbooks in its flaw evaluation.

2.0 EVALUATION

Methods acceptable to the staff for evaluating flaw indications exceeding the allowable flaw size in IWB-3500 are described in IWB-3611 and IWB-3612 of the ASME Code. The licensee used a series of flaw evaluation charts in the Westinghouse handbooks for

ENCLOSURE

9509080259 950906  
PDR ADOCK 05000282  
P PDR

Prairie Island Units 1 and 2 steam generators to perform the evaluation. These flaw evaluation handbooks were developed based on the acceptance criteria of IWB-3611 and IWB-3612, the design transients for the Prairie Island Units 1 and 2 steam generators, the proper formulas from the literature for applied K calculations for surface and embedded cracks, and the fracture toughness curves ( $K_{Ic}$  and  $K_{Ia}$ ) from Appendix A of Section XI of the ASME Code. In the fatigue analysis, the crack growth rate curves used were from Figure A4300-1 of the same appendix. Water environment curves were used for all inside surface flaws, and the air environment curve was used for embedded flaws and outside surface flaws.

The staff reviewed the technical aspects outlined above on flaw evaluation in Westinghouse handbook WCAP-13032, Revision 1, and determined that the methodology in the handbook is appropriate and the criteria are in accordance with the ASME Code. The licensee's flaw evaluation using WCAP-13032, Revision 1, and WCAP-14166, is appropriate and the staff agrees with the licensee's approach.

### 3.0 CONCLUSIONS

The staff reviewed Westinghouse handbook WCAP-13032, Revision 1 (March 1995) and determined that the methodology in the handbook is appropriate and the criteria are in accordance with the ASME Code. Further, the staff determined that the licensee's flaw evaluation using WCAP-13032, Revision 1, and WCAP-14166 is appropriate and agrees with the licensee's conclusion regarding the acceptability of these flaw indications. The staff finds that the reported flaws are acceptable without repair.

Principal contributor: C. Sheng

Date: September 6, 1995

ENCLOSURE