



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

REC'D APR 25 2000

April 19, 2000

Mr. Michael D. Wadley, President  
NSP Nuclear Generation  
Northern States Power Company  
414 Nicollet Mall  
Minneapolis, MN 55401

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 -  
ISSUANCE OF AMENDMENTS RE: REVISED ELEVATED F-STAR (EF\*)  
DISTANCE FOR STEAM GENERATOR TUBES (TAC NOS. MA7126 AND  
MA7127)

Dear Mr. Wadley:

The Commission has issued the enclosed Amendment No. 149 to Facility Operating License No. DPR-42 and Amendment No. 140 to Facility Operating License No. DPR-60 for the Prairie Island Nuclear Generating Plant, Units 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated November 10, 1999, as supplemented February 25, 2000.

The amendments revise the EF\* distance for the steam generator tubes specified in TS 4.12.D.1.(I) following a correction to a minor error in the calculations supporting the current EF\* distance.

A copy of our related safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Tae Kim, Senior Project Manager, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-282 and 50-306

Enclosures: 1. Amendment No. 149 to DPR-42  
2. Amendment No. 140 to DPR-60  
3. Safety Evaluation

cc w/encl: See next page



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 149 TO FACILITY OPERATING LICENSE NO. DPR-42  
AND AMENDMENT NO. 140 TO FACILITY OPERATION LICENSE NO. DPR-60  
NORTHERN STATES POWER COMPANY  
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

By a letter dated November 10, 1999, as supplemented February 25, 2000, Northern States Power Company (NSP or the licensee) requested changes to the Technical Specifications (TSs) for the Prairie Island Nuclear Generating Plant, Units 1 and 2. The licensee proposed to change TS Section 4.12, "Steam Generator Tube Surveillance," to incorporate the revised acceptance criterion for elevated F-star (EF\*) distance. The proposed change is the result of corrections made to tubesheet bending calculations, which are documented in Westinghouse Topical Report WCAP-14255, Revision 2 (proprietary), "F\* and Elevated F\* Tube Plugging Criteria for Tubes with Degradation in the Tubesheet Region of the Prairie Island Units 1 and 2 Steam Generators."

Current TS 4.12.D.1.(I) specifies the EF\* distance of 1.62 inches in accordance with Amendment Nos. 137 and 128, respectively for Prairie Island, Units 1 and 2, issued on August 13, 1998. The licensee proposed to revise the EF\* distance to 1.67 inches.

The February 25, 2000, supplemental letter provided clarifying information that did not change the staff's initial proposed no significant hazards consideration determination and did not expand it beyond the scope of the original *Federal Register* notice.

2.0 EVALUATION

The steam generators at Prairie Island, Units 1 and 2, are Westinghouse Model 51 steam generators. The steam generator tubes were fabricated with mill-annealed alloy 600 material. The segment of tube in the tubesheet has a factory-installed partial hardroll expansion joint, which occupies a length of about 2.75 inches from the tube end.

Over time, degradation has occurred at the original factory-installed hardroll expansion joints of the tube inside the tubesheet. Degraded expansion joints can be repaired by installing additional hardroll expansion joints in the tube inside the tubesheet above the original factory-installed expansion joints. The additional hardroll expansion joint is installed by a mechanical

expander (roller) that is inserted into the tube. At the intended location, the expander pushes the tube wall circumferentially against the tubesheet bore to form a roll expansion joint. The roller has an effective length of 1.8 inches. In actual practice, the field-installed hardroll expansion joint is 2 inches long.

The EF\* criteria are applicable to the hardroll expansion joints installed above the midplane of the tubesheet. One element of the criteria is the EF\* distance. The EF\* distance, as defined in TS 4.12.D.1.(I), is the distance from the bottom of the upper hardroll transition toward the bottom of the tubesheet. The EF\* criteria require that tube defects are not permitted within the EF\* distance.

The technical basis for the EF\* criteria is that a defect-free region having a length equal to the EF\* distance in the expansion joint will provide sufficient structural strength to resist axial pullout loads developed by pressure, thermal, and/or mechanical forces during normal operation, test, upset and faulted conditions. The axial pullout loads acting on the tubes are resisted by frictional forces developed by the elastic preload that exists between the tube and the tubesheet at the hardroll expansion joint. Westinghouse has performed structural calculations and conducted tests on mockups to qualify the current EF\* distance (1.62 inches). The licensee has also demonstrated that EF\* tubes have adequate integrity in terms of primary-to-secondary side leakage. The staff approved the EF\* criteria, including the current EF\* distance of 1.62 inches, via Amendment Nos. 137 and 128.

Subsequent to the issuance of Amendment Nos. 137 and 128, the licensee determined that the EF\* distance requires a revision as necessitated by correcting a minor error in calculating the EF\* distance. In the original tubesheet bending calculations, the secondary side pressure was incorrectly applied to the tubesheet hole surface, resulting in a higher contact pressure than necessary and yielded an EF\* distance that was slightly shorter than desired (1.62 inches rather than 1.67 inches). The difference is 0.050 inches or about 3 percent of the revised EF\* distance. The licensee stated that there is sufficient safety margin in the original EF\* distance calculation which more than offsets the difference of 0.050 inches.

Nevertheless, the licensee proposed that the EF\* distance, as specified in TS 4.12.D.1.(I), be revised from the current 1.62 inches to 1.67 inches based on the revised calculations. The staff finds that the revised EF\* distance of 1.67 inches is acceptable since it was calculated in accordance with the previously approved analytical methodology as described in the staff's safety evaluation supporting Amendment Nos. 137 and 128. Also, the licensee has shown that a tube with the revised EF\* distance applied to the additional hardroll expansion joint satisfies the safety margins in Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," issued in August 1976.

Currently, there are 19 EF\* tubes remaining in service in Prairie Island, Unit 1, and none in service in Prairie Island, Unit 2. The 19 EF\* tubes are located in steam generator 11 with a 2.0-inch roll expansion joint. The licensee has inspected field-installed hardroll expansion joints and found no degradation. The licensee verified that each field-installed hardroll expansion joint in the EF\* tubes has a length of 2.0 inches. The expansion joint length of 2.0 inches in the existing EF\* tubes is greater than the proposed EF\* distance of 1.67 inches; therefore, the existing EF\* tubes with defect-free hardroll joints meet the structural integrity requirements of TS 4.12.

The EF\* distance in the current TS excludes measurement uncertainty. The licensee stated that the measurement uncertainty was not included in the TS because the additional hardroll expansion joint has a physical length of 2.0 inches, which is a function of the roller tooling and is longer than the EF\* distance of 1.67 inches. In addition, the licensee conducted a study to determine accuracy of flaw location measurements relative to the bottom of the upper roll transition. The study contained 16 flaw samples with the participation of 5 data analysts. The study found that flaw location measurements were less than the actual distance from the bottom of the hardroll upper transition to the crack tip. Thus, the measured distance of the defect-free region of the hardroll expansion joint (i.e., EF\* distance) is expected to be less than the actual defect-free region of the hardroll expansion joint. The measured EF\* distance is, therefore, believed to be conservative. The average difference between the measured and actual EF\* distance was about 0.2 inches.

The licensee stated that any tube with a crack indication less than 1.87 inches (i.e., the EF\* distance of 1.67 inches plus measurement uncertainty of 0.2 inches) below the bottom of the upper hardroll would be repaired or removed from service. The licensee stated that, in practice, if a defect exists anywhere in the additional hardroll expansion joint, the affected tube is repaired or plugged. The staff finds that the licensee's approach to disposition degradation in the additional hardroll joints bounds the EF\* distance plus measurement uncertainty and, therefore, is acceptable.

### 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Minnesota State official was notified of the proposed issuance of the amendments. The State official had no comments.

### 4.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration and there has been no public comment on such finding (65 FR 9010). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

### 5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: J. Tsao

Date: April 19, 2000

Prairie Island Nuclear Generating Plant,  
Units 1 and 2

cc:

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Northern States Power Company  
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Office of the Attorney General  
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U.S. Nuclear Regulatory Commission  
Resident Inspector's Office  
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Regional Administrator, Region III  
U.S. Nuclear Regulatory Commission  
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Northern States Power Company  
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Tribal Council  
Prairie Island Indian Community  
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5636 Sturgeon Lake Road  
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Site General Manager  
Prairie Island Nuclear Generating Plant  
Northern States Power Company  
1717 Wakonade Drive East  
Welch, MN 55089



UNITED STATES  
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NORTHERN STATES POWER COMPANY

DOCKET NO. 50-282

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 149  
License No. DPR-42

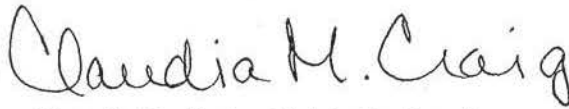
1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Northern States Power Company (the licensee) dated November 10, 1999, as supplemented February 25, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-42 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 149 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink that reads "Claudia M. Craig". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

Claudia M. Craig, Chief, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: April 19, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 149

FACILITY OPERATING LICENSE NO. DPR-42

DOCKET NO. 50-282

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE

TS 4.12-5

INSERT

TS 4.12-5

- (j) F\* Distance is the distance from the bottom of the hardroll transition toward the bottom of the tubesheet that has been conservatively determined to be 1.07 inches (not including eddy current uncertainty). The F\* distance applies to roll expanded regions below the midplane of the tubesheet
  - (k) F\* Tube is a tube with degradation, below the F\* distance, equal to or greater than 40%, and not degraded (i.e., no indications of cracking) within the F\* distance.
  - (l) EF\* Distance is the distance from the bottom of the upper hardroll transition toward the bottom of the tubesheet that has been conservatively determined to be 1.67 inches (not including eddy current uncertainty). EF\* distance applies to roll expanded regions when the top of the additional roll expansion is 2.0 inches or greater down from the top of the tubesheet
  - (m) EF\* Tube is a tube with degradation, below the EF\* distance, equal to or greater than 40%, and not degraded (i.e., no indications of cracking) within the EF\* distance.
2. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair by sleeving all tubes exceeding the repair limit and all tubes containing through-wall cracks or classify as F\* or EF\* tubes) required by Tables TS.4.12-1 and TS.4.12-2.
  3. Tube repair, after April 1, 1999, using Combustion Engineering welded sleeves shall be in accordance with the methods described in the following:  
  
CEN-629-P, Revision 03-P, "Repair of Westinghouse Series 44 and 51 Steam Generator Tubes Using Leak Tight Sleeves";
  4. Tube Support Plate Repair Limit is used for the disposition of a steam generator tube for continued service that is experiencing predominantly axially oriented outside diameter stress corrosion cracking confined within the thickness of the tube support plates. At tube support plate intersections, the repair limit is based on maintaining steam generator serviceability as described below:
    - a. Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with bobbin voltages less than or equal to 2.0 volts will be allowed to remain in service.
    - b. Steam generator tubes, whose degradation is attributed to outside diameter stress corrosion cracking within the bounds of the tube support plate with a bobbin voltage greater than 2.0 volts, will be repaired or plugged, except as noted in Specification 4.12.D.4.c below.



UNITED STATES  
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WASHINGTON, D.C. 20555-0001

NORTHERN STATES POWER COMPANY

DOCKET NO. 50-306

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 140  
License No. DPR-60

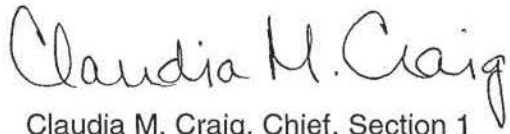
1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Northern States Power Company (the licensee) dated November 10, 1999, as supplemented February 25, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-60 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 140 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink that reads "Claudia M. Craig". The signature is written in a cursive, flowing style.

Claudia M. Craig, Chief, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: April 19, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 140

FACILITY OPERATING LICENSE NO. DPR-60

DOCKET NO. 50-306

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE

TS 4.12-5

INSERT

TS 4.12-5

- (j) F\* Distance is the distance from the bottom of the hardroll transition toward the bottom of the tubesheet that has been conservatively determined to be 1.07 inches (not including eddy current uncertainty). The F\* distance applies to roll expanded regions below the midplane of the tubesheet
  - (k) F\* Tube is a tube with degradation, below the F\* distance, equal to or greater than 40%, and not degraded (i.e., no indications of cracking) within the F\* distance.
  - (l) EF\* Distance is the distance from the bottom of the upper hardroll transition toward the bottom of the tubesheet that has been conservatively determined to be 1.67 inches (not including eddy current uncertainty). EF\* distance applies to roll expanded regions when the top of the additional roll expansion is 2.0 inches or greater down from the top of the tubesheet
  - (m) EF\* Tube is a tube with degradation, below the EF\* distance, equal to or greater than 40%, and not degraded (i.e., no indications of cracking) within the EF\* distance.
2. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair by sleeving all tubes exceeding the repair limit and all tubes containing through-wall cracks or classify as F\* or EF\* tubes) required by Tables TS.4.12-1 and TS.4.12-2.
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