

TAC NOS. M96654/96655

Docket Nos. 50-282/50-306



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**Facsimile Cover Sheet**  
**Northern States Power Company**  
**Prairie Island Nuclear Generating Plant**

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**Date: Feb. 3, 1997**

**Number of pages including this cover sheet: 3**

**Comments:**

Beth,

Here is the Figure that goes with the previous E-mail and a more recent table of the preliminary results of tube inspections.

Jack

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## Prairie Island Unit 2 9701 S/G Inspection Results

Category C-3 Inspection Results  
Preliminary Report to NRC - February 3, 1997

### Preliminary Summary of Tubing Inspection Results

- 1 tube with a reroll has 2 drop/min leakage (21 SG R18C44)
- 9 tubes with rerolls have minor seepage
- 1 tube has an axial indication at the reroll upper transition zone
- About 240 RTZ PWSCC are predicted as candidates for Reroll and F\* criteria
- About 24 tubesheet indications are predicted to be plugged
- About 07 indications are candidates for the pending EF\* criteria
- About 20 other indications are predicted to be plugged (mostly CLTSP Thinning)
- No circumferential indications have been found
- No possible tube support plate ligament indications have been found

In Situ Pressure Testing Equipment is on site - candidates will be selected from the leaking rerolled tube, the seeping rerolled tubes, new RTZ indications and other tubesheet crevice indications, and free span indications greater than 0.3 inch long.

#### Schedule

- Inspection: Started on January 30, 1997
- Repair: Scheduled to start on February 8, 1997
- In situ pressure testing to be done at beginning of repair phase

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To Beth Wetzel	From Jack Leveille
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## ET Examination and Primary Side Visual Inspection Plan

Examination Description	Status/No of Tubes			
	21 SG		22 SG	
Hot Leg Tubesheet: 100% MRPC with +Point™ TEH to TSH + 4 inches	56%	3256	86%	3216
Cold Leg Tubesheet: 20% MRPC with +Point™ TEC to TSC + 4 inches (1st time for +Point in CL Tbsht)	Done	652	Done	644
MRPC with +Point of all existing rerolls	56%	288	86%	113
Bobbin - 100% Full Length	33%	3256	45%	3216
UBend MRPC with + Point™ - all Rows 1 and 2		183		185
Supplemental RPC with +Point™ from Bobbin Results				
+Point rotating coil of HL B&W plugs (1st time for +Point in B&W plugs)		19		13
Post Installation Examination of all new Rerolls with +Point and Bobbin coils				
Visual Examination of All Plugs	Done	132		172
Visual Examination of Tubesheet under Secondary Hydro pressure of 700 to 800 psig.	Done			Planned

This is the second use of the +Point coil in the Unit 2 steam generators, except where noted above

**Supplemental Rotating Coil Examinations** are done on the following bobbin calls:

- Any ADR, DRI, DSI, DTI, PLP, UDI, PSI
- All Dents > 5.0 volts
- Selected bobbin calls > 40%

The qualified sizing techniques being used are 1) wear at anti-vibration bars or loose parts and 2) wastage at outer peripheral lower cold leg tube support plates.

There are no sleeves in Unit 2

Visual Inspections for Leakage under Secondary Side Pressure Tests were schedule due to a constant 2 to 4 GPD leak during the previous cycle.

## Preliminary Results of Tubing Inspections

Location/Degradation Mechanism	Results - Feb 2, 97	
	21 SG	22 SG
Visual Inspection of Plugs	No Problems	Planned
Visual Inspection for Leakage with 700 to 800 psig	10 tubes <sup>1</sup>	In Progress
HL Tube End Axial Indications/PWSCC?	10	23
HL Roll Transition Zone Axial Indications/PWSCC	117	88
HL Tubesheet Crevice Region Sec. Side IGA/SCC	2	1
HL Top of Tubesheet/ IGA/SCC	2	8
HL Additional Rerolls (installed in 9505)/PWSCC	1 <sup>2</sup>	
Free Span/Unknown		
Top of Tubesheet CL/Unknown	2	1
Peripheral Lower Cold Leg Tube Support Plates/Wastage		3
Hot Leg Tube Support Plates/Some type of IGA?		
Cold Leg Tube Support Plates/Not Wastage		
Anti-vibration Bar Locations, Wear		
Rows 1 and 2 U-Bends, PWSCC		
Loose Parts/Wear		
Other		
Tube Support Plate Ligament Possible Indications		

<sup>1</sup>One tube, 21 SG R18C44, with a reroll has a substantial RTZ axial indication and is the primary source of the operational leakage. Nine tubes with rerolls and RTZ indications have signs of moisture.

<sup>2</sup>One reroll has developed a single axial indication at the upper roll transition.

### Repair Criteria:

- $\geq 40\%$  TWD ( $\geq 50\%$  Old AVB locations) for EPRI Appendix H qualified sizing techniques (cold leg tube support plate thinning and wear)
- Any Axial, Circumferential, Volumetric or Mixed Mode RPC indication
- F-Star Criteria for Lower Region of Tubesheet
- EF-Star Criteria for Upper Region of Tubesheet (pending NRC approval)

### Plug Removal

Steam Generator	Cold Leg
21	40
22	105
Total	145

## **REROLL LEAKAGE PERFORMANCE**

### **Reasons for Leakage - R18C44**

Hydraulic expansion process can open the roll transition zone crack or other cracks present in the hydraulic expansion zone. Examination of the 9505 post reroll RPC shows significant change in the indication. It is postulated that the indication became through wall during the hydraulic expansion (was not leaking during hydro prior to rerolling). Primary to secondary side leakage did appear during startup in July 1995 and stayed fairly constant the entire cycle. This indicates the reroll was not leak tight. No other indications are present in the tubesheet region in this tube.

The operational experience over the last cycle indicates that the reroll process is still a viable repair tool. The leakage through the one large leak was constant throughout the 570 day cycle. Seepage of moisture within the other 9 tubes occurred after 2 days at about 740 psig secondary side pressure. This is a very conservative pressure test due to the reverse pressure conditions and the time pressure was maintained compared to normal ASME Code requirements for hydrostatic pressure tests.

After reviewing the NRC Safety Evaluation Report, the Prairie Island Technical Specification 4.12 and its basis, and NSP's responses to additional questions for the F\* License Amendment Request, it is our position that the F\* criteria is a leak limiting criteria and that leakage from reroll joints is acceptable within the requirements of the SER and the Technical Specification. We expected the hard roll joints to be leak tight if no hard scale was present, but it appears conditions in the tubesheet crevice region will not always provide leak tight reroll joints and will not always provide a distinguishing torque trace. We are investigating possible causes for the leakage through the hard roll and it will be a couple of days before we complete this investigation.

### **Preliminary Action Plan for Evaluating Rerolls with Leakage**

- Evaluate previous torque traces, calibration records, etc.
- Conduct profilometry of selected rerolls.
- Determine leak rate at MSLB conditions with in situ pressure tests of selected rerolled tubes
- Evaluate process parameters against qualification report
- Confirm changes in RTZ ET indications after hydraulic expansion

### **Additional Roll Expansion Process - ABBCE**

1. **Eddy Current examination** using Rotating Pancake Coil (RPC) technology (or equivalent) of the tubesheet region to determine that there is sound tubing (i.e. No detectable degradation by RPC) in the region of the additional roll expansion.
2. **Brushing** of the inside diameter to clean the tube in the region of the re-roll.
3. **Hydraulic expansion** over a 5 inch length starting at 1.5 inches from the tube end.
4. **Hard roll expansion** of 1.25 inches of tubing centered at 4.5 inches from the tube end. (leaves about 1 inch between the original hard roll and the new hard roll)
5. **Eddy current examination** using a bobbin probe and a rotating pancake coil to look for cracks in the new hard roll and hydraulic expanded region.
6. **Reexamination** of the F\* tube F\* region for the next two refueling outages.

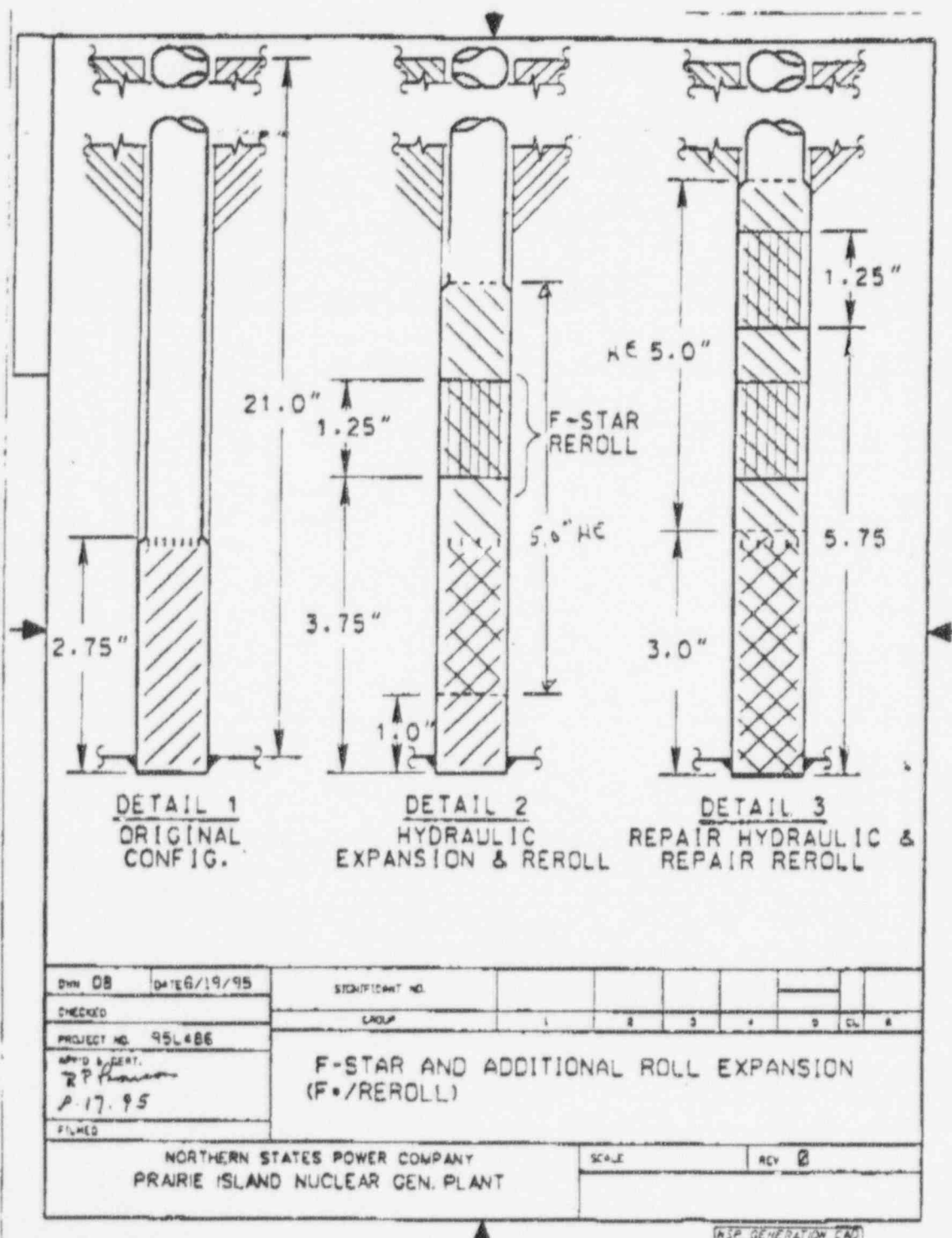


PRAIRIE ISLAND NUCLEAR GENERATING PLANT  
NORTHERN STATES POWER COMPANY

RADIATION PROTECTION PROCEDURES

<b>D</b> Section	TITLE	NUMBER:
	F* AND ADDITIONAL ROLL EXPANSION OF STEAM GENERATOR TUBES S/G NO _____	D27.23
		REV: 1
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FIGURE 1 — F-STAR AND ADDITIONAL ROLL EXPANSION  
(F\*/REROLL)



## Secondary Side Inspection Plan

- **Visual Inspections for Internals Integrity (one steam generator)**
- Inspection for indication of wrapper drop in both steam generators via the handholes. There has previously been no noticeable drop.
- Visual inspection of anti-rotation device
- Possible visual inspection of wedge block region at top tube support plate, if accessible via a swirl vane (will not expend a lot of effort)
- Visual inspection of the wrapper support plate blocks and windows in one steam generator
- Visual inspection for gross wastage of flow holes in top support plate at outer periphery
- Standard Inspections in one steam generator each outage
  - 1 Visual inspection of feed ring holes and plugs
  - 2 MT inspection of inner radius of feedwater nozzle elbow
  - 3 Visual inspection of inner radius of upper shell transition weld
  - 4 Visual inspection of feedwater ring hangers
  - 5 Welch Allyn inspection of u-bend region of tubes through a swirl vane
  - 6 Visual inspection for cleanliness of drain pots from Chevron separators
  - 7 UT inspection for wall thinning of feedwater ring tee has been done previously (was satisfactory)
- 1 **Analysis of ET data for support plate damage per guidelines below**
  - 1 Use Computerized Data Screening to look at all tubes for significant ligament cracks
  - 2 Examine all possible support plate ligament indications from the bobbin results with RPC.