POINT BEACH NUCLEAR PLANT UNIT 2

STEAM GENERATOR REPLACEMENT PROJECT

STEAM GENERATOR REPLACEMENT REPORT

ATTACHMENT B SHT 1 3
CALC NO.:
PBNP-IC-25

9610020099 960926
PDR ADOCK 05000266
P PDR

REVIEW AND APPROVAL RECORD

PLANT Point Beach Nuclear Plant UNIT 2

PROJECT Steam Generator Replacement Project

DOCUMENT TITLE Steam Generator Replacement Report

REVISION NO. 0

REVIEW AND APPROVAL:

GROUP	INTERFACE TYPE			PREPARED BY/ DATE	REVIEWED/ VERIFIED BY/ DATE
	INPUT	REVIEW	N/A		
CIVIL		X			
MECH		X			
ELECT		X			
LICN	X				
ALARA		X			
SP PROC		X			
CEM		X			

OVERALL APPROVAL BY: _____ DATE: _____
Design Engineering/Licensing Manager

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The RSG tube bundle ~~is designed to have~~ has more U-tubes than the OSG tube bundle (3499 versus 3260), and hence a greater heat transfer surface area (47,500 versus 44,300 square feet) and cross flow area. These features provide greater heat transfer and a slight increase in best estimate primary flow rates to enhance thermal performance. This, in turn, offsets the reduction in material thermal conductivity from RSG use of thermally treated Alloy 690, as compared to mill annealed Alloy 600 used in the OSG tubing.

3.2.3 Material Comparison

Materials used in the fabrication of the RSGs are equivalent to those used in the OSGs, with the following notable exceptions, ~~listed below~~. These material changes do not compromise the performance of the RSGs.

- The shell barrels plate material has been changed from ASME SA-302, Grade B to ASME SA-533 Type B, Class 2.

- The transition cone material has been changed from ASTM A-283 seam welded plate to ASME SA-508, Class 3 hollow forgings.

- The elliptical head material has been changed from ASME SA-302, Grade B plate to ASME SA-508, Class 3a forging.

- The tube plate forging material has been changed from ASME SA-336 to ASME SA-508, Class 3a.

- The tube support plate material has been changed from ASME SA-285, Grade C to ASME SA-240, Type 405.

- The steam generator tubing material has been changed from ASME SB-163 Alloy 600 to ASME SB-163 Alloy Tube Set 690 (Code Case N-20-1).

- The AVB material has been changed from SB-166 Alloy 600 with chromium plating to A-479 Type 405 stainless steel. AVB ends will have thermally treated SB-167 Alloy 690 end caps secured to SB-166 Alloy 690 retaining rings.

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FACSIMILE

DATE: MAY 5, 1994

TO:
VECTRA TECHNOLOGIES, INC.
1330 BUTTERFIELD ROAD
SUITE 550
DOWNERS GROVE, IL. 60515

KAREN DEPODASTA
FAX # 708-512-8660
PHONE # 708-512-8659

FROM:
THE FOXBORO COMPANY
33 COMMERCIAL STREET
D.3347/B52-2K
FOXBORO, MA. 02035

DAVID R. RINGLAND
FAX # 508-549-6580
PHONE # 508-549-6333

FILE: VECTRA - CALCULATION INFORMATION FOR N-E10 SERIES TRANSMITTERS.

SUBJECT: YOUR FACSIMILE TO OUR MR. F. BONFANTI, DATED MARCH 29, 1994.

PAGES: THREE INCLUDING THIS PAGE.

COPIES: F. BONFANTI, CH1-01
R. SCHWANTIES CH1-01

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Responses to Questions from Vectra Regarding N-E11 and N-E13 Transmitters

References: PSS9-1B1A (1984)
and FOXBORO Qualification Document QOAAC11

1. Accuracy expressed as a +/- % does include the combined effects of linearity, hysteresis, deadband and repeatability. Each of the aforementioned characteristics has a specified limit. The specified limits are not additive to the accuracy specification. All specification are in % of Span.

2. The performance characteristics in Question/ Response 1. are measured at "Reference Operating Conditions" and performance at "Normal Operating Conditions" includes the influences of Ambient Temperature Effects, etc. Accuracy under ambient temperature changes does affect the zero and span of the transmitter. The other characteristics should not change, but are not specified at other than reference operating conditions. Using the example of an N-E11DM transmitter the Ambient Temperature Effects are specified as follows:

Span Settings,% of USL		Zero Shift,% of Span	
Above	Upto	per 100F Change (32 to 180F)	per 170F Change (80 to 250F)
80%	100%	+/-1%	+/-2%
50%	80%	+/-1.5%	+/-3%
20%	50%	+/-2.5%	+/-5%

Span Change: +/-1.25% per 100F

Example: N-E11DM-IIB, Calibrated Range: 0-100 psi
USL:200 psi
100 psi = 50% of USL 200 psi therefore the Ambient Temperature Effects are :
+/-2.5%/100F or +/-5%/170F

Relative Humidity Effects: Negligible
(N-E11 and N-E13 Transmitters are sealed for DBE of LOCA/HELB to 85 psi, thus humidity has no effect.)

3. The "Normal Radiation" Specification of +/-0.5% for a TID of 3.5×10^4 rads gamma is in addition to the accuracy specification. FOXBORO Qualification Report QOAAC11, Sect.IV., Pg. IV-25 does show graphically several other lower radiation levels for an N-E11GM transmitter which is similar to an N-E11DH transmitter. The radiation effects can be zero and span adjusted to return to the normal accuracy specification.

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4. The Seismic DBE performance specifications of +/-5% During and +/-1% After are for both OBE and SSE events. These limits were set as goals in the transmitter qualification program and we did not attempt to determine a threshold response spectrum. Reviewing the qualification data for the similar transmitter an N-E11GM (F1) whose span setting was 40% of the USL, it is possible that spans above this setting do have better performance specifications.

5. The LOCA/HELB Output Shifts of +/-8% at 25% of USL and +/-3% at USL can be interpolated for span settings in-between these limits. Using the N-E11GM from the qualification test the span setting was 40% of USL thus the +/-8% spec. would be selected.
Using the Ambient Temperature Effects table as follows the 50 to 80% span settings can be developed:

Span Settings, % of USL		Output Shift, % of Span	Span* Setting Ratio	Output Shift, % of Span
Above	Upto	1st 3 Hrs.	Ref.	50 to 80%
80%	100%	+/-3%		
50%	80%	-----	1.5	+/- 4.5%
20%	50%	+/-8%	2.5	

Adding margin we would specify the Output Shift at +/-5% for the 50 to 80% of USL settings.
*The LOCA/HELB is an event similar to ambient temperature effects and the use of the normal ambient temperature specifications is justified in deriving an error ratio for the 50 to 80% settings and applied to the USL specification.

Note: The N-E11GM and N-E11DH transmitters have the same Ambient Temperature Effects as stated above, for other N-E10 Series Transmitters the manner of specification differs and must be reviewed individually.

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PRELIMINARY

Deliverables.

1. Tables for each PMA term calculated.
2. Tables for GENCODE inputs to the PMA calculations (limited to bounding uprated conditions.)
3. SG PMA Customer notification letter
4. Sample calculation demonstrating method of the calculations.

Post-it® Fax Note 7671 | Date 8/27/96 | # of pages 5
To Karen DeLaCosta | From Gene Gross
Co./Dept. Duke | Co. WEPCo
Phone # | Phone #
Fax # | Fax #

ATTACHMENT D SH 1 of 3
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PRELIMINARY

Attachment A

Table 3

Setpoint	Low Setpoint			
Process Measurement Allowance	Unit 1 44F Current Tap Current Power	Unit 1 44F Current Tap Uprated Power	Unit 1 44F Relocated Tap Uprated Power	Unit 2 Δ47 Uprated Power
Process Pressure High	+ 0.0006%	- 0.048%	+ 0.2356%	+ 0.2356%
Process Pressure Low	+ 0.1662%	+ 0.1662%	- 0.2852%	- 0.2852%
Fluid Velocity Effects	- 0.242%	- 0.242%	- 2.0423%	- 1.6368%
Downcommer Subcooling	+ 1.1811%	+ 0.7376%	+ 1.3189%	+ 1.3906%
Combined Velocity and Subcooling effects	+ 0.939%	+ 0.4956%	- 0.7235%	- 0.2462%

Notes:

1. All values are in percent of instrument water level span.

2. Unit 2 Δ47 Steam Generators at uprated conditions bounds current power level operation.

3. With the current tap location setpoint is 20% Narrow Range Span for Unit 1. Relocated span is calculated at 30% Narrow Range Span.

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PRELIMINARY

Attachment A

Table 4

Setpoint	Low - Low Setpoint			
Process Measurement Allowance	Unit 1 44F Current Tap Current Power	Unit 1 44F Current Tap Uprated Power	Unit 1 44F Relocated Tap Uprated Power	Unit 2 Δ47 Uprated Power
Process Pressure High	- 0.0017%	- 0.1892%	+ 0.0945%	+ 0.0945%
Process Pressure Low	+ 0.3908%	+ 0.3908%	- 0.0606%	- 0.0606%
Fluid Velocity Effects	- 0.2315%	- 0.2315%	- 1.9175%	- 1.5505%
Downcommer Subcooling	+ 0.9638%	+ 0.606%	+ 1.125%	+ 1.1854%
Combined Velocity and Subcooling effects	+ 0.7323%	+ 0.3745%	- 0.7925%	- 0.3651%

Notes:

1. All values are in percent of instrument water level span.

2. Unit 2 Δ47 Steam Generators at uprated conditions bounds current power level operation.

3. With the current tap location setpoint is 20% Narrow Range Span for Unit 1. Relocated span is calculated at 25% Narrow Range Span.

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Attachment 2

Revised FSAR Mark-up for the Steam Generator Tube Rupture Accident

TABLE 14.2.4-1

THYROID DOSES AND WHOLE BODY DOSES
STEAM GENERATOR TUBE RUPTURE ACCIDENT

A. With Pre-Accident Iodine Spike ~~(With Off Site Power (condensers) are available)~~

0 - 2 HOUR DOSE AT SITE BOUNDARY		0 - 6 HOUR DOSE AT LPZ	
THYROID	~~Whole~~ BODY	THYROID	~~Whole~~ BODY
REM		REM	
15.1 ~~28.2~~ ~~6.6x10~~	4.4 ~~4.42x10^{-2}~~ ~~1.11x10~~	1.8 ~~2.5~~ ~~6.5x10~~	5.0×10^{-3} ~~1.31x10~~

B. With Accident Initiated Iodine Spike ~~(No Off Site Power (condensers are not available))~~

0 - 2 HOUR DOSE AT SITE BOUNDARY		0 - 6 HOUR DOSE AT LPZ	
THYROID	~~Whole~~ BODY	THYROID	~~Whole~~ BODY
REM		REM	
3.6 ~~16.7~~ ~~6.5x10~~	4.4 ~~4.42x10^{-2}~~ ~~1.11x10~~	0.45 ~~2.2~~ ~~6.6x10~~	5.0×10^{-3} ~~1.31x10~~

NOTE:
1. Fuel Defect = 1%
2. Primary to Secondary Leak Rate = .35 GPM

Attachment 3

Technical Specifications Section 15.3.4 Basis

The PBNP FSAR Table 4.1-4 shows that the largest steam generator liquid volume is based on the Unit 1 Steam Generators. This volume (2877 ft^3 = 81.5 m^3) is being used as the appropriate value for Basis of TS 15.3.4. The edited Technical Specifications page 15.3.4-3 is provided with this attachment.

For the purposes of determining a maximum allowable secondary coolant activity, the steam break accident is based on a postulated release of the contents of one steam generator to the atmosphere using a site boundary dose limit. The limiting dose for this accident results from iodine in the secondary coolant. I-131 is the dominant isotope because of its low MPC in air and because the other iodine isotopes have shorter half-lives and therefore cannot buildup to significant concentrations in the secondary coolant, given the limitations on primary system leak rate and activity. It is assumed that the accident occurs at zero load, which is when the maximum amount of water is contained in one steam generator. One tenth of the contained iodine is assumed to reach the site boundary, making allowance for plate-out and retention in water droplets. It is conservative to measure gross beta-gamma activity except when the gross activity exceeds or equals 1.2 μCi/cc. At this time the iodine-131 activity must be measured.

The maximum inhalation dose at the site boundary is then as follows:

$$\text{Dose (rem)} = \frac{C \times V}{10} \times B(t) \times \frac{\chi}{Q} \times DCF$$

where:

C = secondary coolant activity (1.2 μCi/cc = 1.2 Ci/m^3)

V = water volume in one steam generator
(~~2821~~ 2877 ft^3 = ~~80~~ 81.5 m^3)

B(t) = breathing rate (3.47 x 10^{-4} m^3/sec)

χ/Q = 3.0 x 10^{-4} sec/m^3 (4)

DCF = 1.48 x 10^6 rem/Ci I-131 inhaled

The resultant dose is ~~slightly less than~~ approximately 1.5 rem.

References:

FSAR Section 10

FSAR Section 14

Attachment 4

Clarification of the Total Primary Heat Output Changing from 1518.5 MWt to 1524.5 MWt

The FSAR mark-up provided as an attachment to the previous supplement to Technical Specifications Change Request 188 and 189, dated August 5, 1996, contained a change to identify the Total Primary Heat Output as 1524.5 MWt compared to the previous value of 1518.5 MWt listed in FSAR Table 4.1-4. It has been determined that this parameter should include the approximate amount of heat (thermal power) generated by the Reactor Coolant Pumps. This is approximately 6 MWt.

Attachment 5

Non-proprietary Version of OTΔT and OPΔT Uncertainty Analysis with Affidavit
in accordance with the requirements of 10 CFR 2.790

Enclosed are:

1. 5 copies of "Setpoint Methodology for Overtemperature - ΔT and Overpower - ΔT Reactor Protection Setpoints for Point Beach Units 1 and 2," dated March 1996 (Proprietary).

2. 5 copies of "Setpoint Methodology for Overtemperature - ΔT and Overpower - ΔT Reactor Protection Setpoints for Point Beach Units 1 and 2," dated March 1996 (Non-Proprietary).

Also enclosed are a Westinghouse authorization letter, CAW-96f-1007 accompanying affidavit, Proprietary Information Notice, and Copyright Notice.

As Item 1 contains information proprietary to Westinghouse Electric Corporation, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets for the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations.

Accordingly, it is requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR 2.790.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse Affidavit should reference CAW-96-1007 and should be addressed to N.J. Liparulo, Manager of Regulatory and Engineering Networks, Westinghouse Electric Corporation, P.O. Box Pittsburgh Pennsylvania 15230-0355.