Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

January 30, 2001

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket No. 50-328
Tennessee Valley Authority	)	

SEQUOYAH NUCLEAR PLANT - UNIT 2 CYCLE 10 (U2C10) 12-MONTH STEAM GENERATOR INSPECTION REPORT AND 90-DAY REPORT FOR VOLTAGE-BASED ALTERNATE REPAIR CRITERIA

In accordance with the requirements of Sequoyah Unit 2 Technical Specification 4.4.5.5.b, TVA is submitting the 12-month steam generator inspection report that includes the results of inservice inspections performed during the U2C10 refueling outage. Enclosed is the 12-month steam generator inservice inspection report that addresses the active and potential damage mechanisms identified in the Sequoyah Unit 2 Degradation Assessment.

In addition, TVA is providing the 90-day alternate repair criteria steam generator report that contains results of voltage-based repair criteria for Cycle 11 operation. The 90-day report is provided in accordance with Sequoyah Unit 2 License Condition 2.C.(8)(b).

The alternate repair criteria for axial outside diameter stress corrosion cracking at tube support plates continued to be applied during this inspection. The details of alternate repair criteria implementation for Cycle 11 operation is provided as Attachment 1 to the enclosed report.

The alternate repair criteria for primary water stress corrosion cracking was not implemented during the U2C10 steam generator inspection. Primary water stress corrosion cracking was detected in two tubes which were plugged following the inspection. Accordingly, the alternate repair was not implemented during the U2C10 steam generator inspection and no reports are required.

D030

If you have any questions, please call me at (423) 843-7170 or Jim Smith at (423) 843-6672.

Sincerely,

Pedro Salas
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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)

(UNIT 2)

Unit 2 Cycle 10 Refueling Outage

Steam Generator Inspection Report

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GLOSSARY OF ACRONYMS

BOC	Beginning of operating cycle. The current inspection is just prior to BOC-11
EOC	End of operating cycle. The current inspection is at EOC-10
POD	Probability of detection. This value is set equal to 0.6 for the GL 95-05 predictive analysis for the condition
ODSCC	Outside diameter stress corrosion cracking
SG	Steam generator
TSP	Tube support plate
ARC	Alternate repair criterion
PWSCC	Primary water stress corrosion cracking
HTS/TTS	Hot leg top of tubesheet
AVB	Anti vibration bar
PDA	Percent degraded area. This is a measure of average depth of a circumferential crack around the 360° circumference of the tube
GL 95-05	NRC Generic Letter 95-05. Approved methodology for and ARC for ODSCC at TSPs. Allows for cracks, which meet a voltage criteria to remain in service
POB	Probability of tube burst
DSI/PI	Acronym used during eddy current analysis to describe ODSCC at TSPs

INTRODUCTION

During the scheduled Sequoyah Nuclear Plant (SQN) Unit 2 End of Cycle 10 (EOC-10) refueling outage, extensive inservice inspections were conducted in all four steam generators (SGs) to address all active and potential damage mechanisms identified in the Unit 2 Degradation Assessment. The results of the inspections were classified as follows:

	SG1	SG2	SG3	SG4
Bobbin	C-2	C-2	C-2	C-3
TTS RPC	C-2	C-2	C-2	C-2
Dented TSP Inspection	C-1	C-2	C-2	C-1
Dented Freespan	C-1	C-1	C-1	C-1
U-Bend +Point	C-1	C-3	C-3	C-3

Alternate Repair Criteria (ARC) for axial outside diameter stress corrosion cracking (ODSCC) at tube support plates (TSPs) continued during this inspection. The details of this implementation are included in the enclosed report as Attachment 1. The details of the C-3 categorization of the U-Bend and Bobbin inspection was previously provided in SQN's 15-day plugging report and was submitted by letter dated November 16, 2000 .

ARC for axial primary water stress corrosion cracking (PWSCC) at dented TSPs was not implemented this inspection. Only two tubes were identified with PWSCC at TSPs. Both tubes were plugged. This was the first occurrence of PWSCC at dented TSPs at SQN U2. Because ARC was not implemented, the ARC 120-day report described by SQN TS 4.4.5.5.e is not required.

The enclosed report fulfills the reporting requirements of SQN Technical Specification section 4.4.5.5.b for reporting results of SG inservice inspection.

SG TUBE INSERVICE INSPECTION SCOPE

The SQN SG tube inservice inspection (ISI) initial sample and expansion for all SGs and all damage mechanisms was as follows:

Initial Scope

100% full-length bobbin examination in all 4 SGs.

100% hot leg top of tubesheet (HTS) (WEXTEX transition region) examination in all 4 SGs with Plus Point probe.

100% Row 1 and 2 U-Bend examinations in all 4 SGs with magnetic biased ZETEC plus point Row 1&2 U-Bend probe.

100% >=5 volt hot leg dented TSP intersections in all 4 SGs with Plus Point probe.

100% >=2 volt and <5 volt hot leg dented TSP intersections in all 4 SGs with Plus Point probe up to and including the third support plate and a 20% sample at the fourth support plate.

100% of <2 volt dented TSP intersections were examined during the bobbin coil examination utilizing the qualified technique for detection of PWSCC. This requires extensive analyst training and testing.

20% sample of hot leg freespan dents from HTS to second hot leg TSP

Expansion

Due to the detection of axial PWSCC in a Row 2 U-Bend in SG 4, the U-Bend inspection was expanded to 20% of the Row 3 U-Bends in SG 4. During this expansion, a PWSCC axial indication was identified in Row 3. 100% of Row 3 and 20% of Row 4 U-Bends were then inspected in all 4 SGs.

All test techniques used for detection were EPRI Appendix H qualified examination techniques and validated for use at SQN. Sizing techniques were also Appendix H documented where available. If documented sizing techniques did not exist, the best available technique was used.

Immediately prior to the inspection, TVA tested the tube samples used in the EPRI U-Bend technique qualification with the high frequency magnetically biased plus point coil. Included in the test samples are three tubes donated by TVA that were stress relieved to replicate the in-generator condition. The data from these samples shows that there is a reduction in flaw amplitude with the

new probe and that the signal to noise ratios of the mid-range coil are a factor of approximately two to four times greater than the high frequency magnetically biased probe. Although all of the flaws detected in the original qualification of the mid-range coil are also detected with the high frequency coil, there is a clear advantage with the mid-range coil. Therefore, the plus point inspection of the low row u-bends was conducted with the mid-range probe.

In addition, the following changes were implemented:

- All analysts received training on the leaking tube from Indian Point 2 as it appeared in the 1997 examination data.
- A circumferential filter was used to assist in flaw detection when bend geometry presented interfering signals.
- Signals that impede the detection of indications were plugged based on recent industry experience.

SG TUBE INSPECTION RESULTS

As a result of plugging 64 tubes EOC-10, Unit 2 SGs are 2.2% plugged. Status of each SG is described in Table 1 below:

Table 1

	SG1	SG2	SG3	SG4	Total
Previously Plugged	**39**	**107**	**68**	**25**	**239**
Plugged EOC-10	**8**	**16**	**14**	**26**	**64**
Total Tubes Plugged	**47**	**123**	**82**	**51**	**303**

Main steam line differential pressure is 2560 psi, and three times normal differential pressure is 4176 psi.

Degradation Mechanisms Detected

AVB Wear

Based on past indications and growth rate data from past outages, three tubes were predicted to be plugged for AVB wear. A total of 92 indications were detected in 52 tubes. Two indications in one tube exceeded the 40% repair limit and the tube was plugged. The 40% repair limit is conservative for SQN Unit 2 SGs for structural and leakage performance criteria. The limiting indication was 41% maximum depth, which has a calculated burst pressure of 6314 psi.

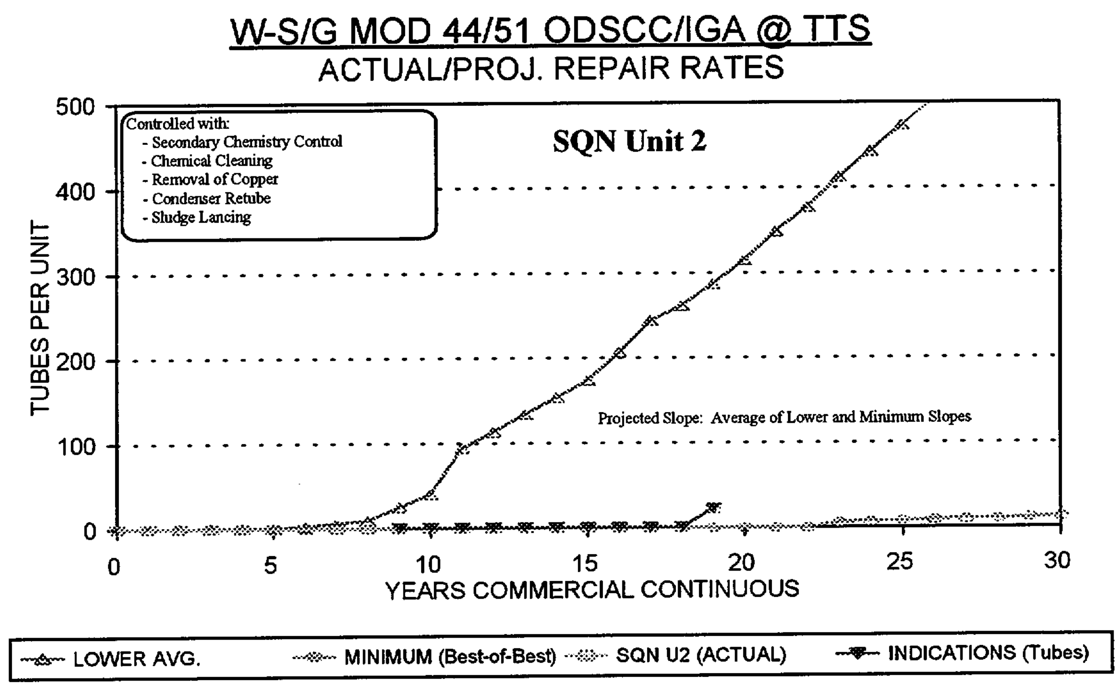
Cold Leg Wastage

Six tubes were predicted to be plugged for cold leg wastage. A total of 100 indications were detected in 95 tubes. Two indications exceeded the repair limit of 40% through wall and the tubes were plugged. The 40% repair limit is conservative for SQN Unit 2 SGs for structural and leakage performance criteria. The limiting indication was 44% maximum depth, which has a calculated burst pressure of 5906 psi.

ODSCC HTS

ODSCC at HTS was not predicted for SQN Unit 2 SGs until later inspections based on SQN 2 operating experience, good chemistry, and chemical cleaning. However, identifying this mechanism is not unusual for Model 51. SQN 2 is still well below industry experience. Figure 1 below shows the lower average of the Model 51 SGs and the actual indications and predicted slope for SQN 2.

Figure 1



A total of 15 axial indications were identified in 14 tubes, and 10 circumferential indications in 8 tubes.

All ODSCC HTS indications were plugged on detection and sized using the Plus Point probe. No indication exceeded structural or leakage screening criteria.

Condition Monitoring for ODSCC HTS

The limiting ODSCC axial HTS indication is SG4 R4 C6 located at HTS-0.74. This indication was 0.28" long and had an average depth of 61.54%, a maximum depth of 82%, and 0.22 volts. The calculated burst pressure for this indication is 5007 psi.

The limiting ODSCC circumferential HTS indication is SG1 R12 C90 located at HTS+0.11. This indication was 60°, 9.76 percent degraded area (PDA), a maximum depth of 86%, and 0.40 volts. The calculated burst pressure for this indication is 7846 psi.

Based on voltage, none of the indications identified during the inspection would be expected to leak even in accident conditions.

No changes to the existing SG program or chemistry program is warranted due to the earlier than expected occurrence of ODSCC at the HTS. All HTS ODSCC met condition monitoring performance criteria.

ODSCC TSP

The ARC for axial ODSCC at TSPs continued to be implemented this inspection and a detailed report is included in this report as Attachment 1.

PWSCC HTS

HTS PWSCC was predicted in the degradation assessment based on SQN and industry experience. A total of 10 axial indications were identified, and a total of 5 circumferential indications were identified.

All PWSCC HTS indications were plugged on detection and sized using the Plus Point probe. No indication exceeded structural or leakage screening criteria.

Condition Monitoring for PWSCC TTS

All HTS axial PWSCC indications were inside the tubesheet. The limiting indication is SG2 R21 C50. This indication was 0.15" long, with an average depth of 71.33%, a maximum depth of 98%, and 0.63 volts. This indication was 0.18" inside the tubesheet. The calculated burst pressure for this indication is 5811 psi.

The limiting HTS circumferential PWSCC is SG3 R12 C36 located at HTS-0.14. This indication measured 77°, with a 7.34% PDA, a maximum depth of 66%, and 0.75 volts. The calculated burst pressure for this indication is 7948 psi.

Based on voltage, none of the PWSCC indications would be expected to leak even in accident conditions.

All HTS PWSCC met condition monitoring performance criteria.

PWSCC TSP

An ARC was approved for SQN 2 for axial PWSCC at dented TSPs; however, since only 2 tubes were affected this inspection, the ARC was not implemented.

Five tubes were predicted to be identified with axial PWSCC, and 3 indications in 2 tubes were identified. One tube had two axial cracks; however, they were parallel and far enough apart to be analyzed as separate cracks. Both tubes were plugged and no indication exceeded screening criteria for structural or leakage integrity.

Condition Monitoring for Axial PWSCC TSP

The limiting axial PWSCC TSP indication is SG2 R9 C51 located at H03-0.17. This indication measured 0.16" long, with an average depth of 49.25%, a maximum

depth of 78%, and 0.45 volts. The calculated burst pressure for this limiting indication is 6204 psi.

Based on voltage none of the indications would be expected to leak even in accident conditions.

All axial PWSCC TSP indications met condition monitoring performance criteria.

<u>PWSCC U-Bend</u>

Six tubes were predicted to be affected by PWSCC in the Row 1 U-bend area in the degradation assessment. Row 1 and 2 U-Bends were heat treated in situ March 1987, however, they operated several cycles prior to heat treating. Particular sensitivity was stressed to the data analysts with regard to PWSCC in the low row U-Bends. Identifying PWSCC in Row 2 was a new inspection finding; however, since Row 2 tubes operated for 6.5 EFPY prior to heat treating, it is not unlikely that a crack could have initiated prior to heat treating and has now grown to detection. Row 3 tubes were not heat treated, and though they were not predicted to crack until much later in life, three other plants have identified small numbers of cracks in Row 3 tubes. The 100% inspection of Rows 1, 2 and 3 provides a high confidence that no significant crack was left in service.

A total of 13 axial PWSCC indications in 8 tubes and 3 circumferential PWSCC indications in 3 tubes were identified.

All U-Bend indications were plugged on detection and sized using the Plus Point probe. One indication exceeded the first leakage screening criteria. It did not exceed the second screening criteria; however, due to the questionable sizing capabilities, this tube was in situ pressure tested to 3 times normal operating pressure with no sign of leakage. The EPRI In Situ Guidelines were used as well as the Interim Guidelines issued by the EPRI Steam Generator Management Committee October 2000.

<u>Condition Monitoring for U-Bend PWSCC</u>

The limiting U-Bend axial PWSCC indication is SG4 R2 C68. This indication was 0.18" long, with an average depth of 81%, a maximum depth of 98%, and 0.16 volts. The calculated burst pressure for this limiting indication is 6030 psi.

The limiting U-Bend circumferential PWSCC is SG2 R1 C38. This indication was 53°, 3.32 PDA, 48% maximum depth, and 1.8 volts. The calculated burst pressure for this limiting indication is 9007 psi.

The only tube (SG 2, R1C38) that would be expected to leak was in situ pressure tested to 3 times normal operating pressure and had no sign of leakage.

The identification of PWSCC in Row 2 and 3 will increase the initial scope for the SQN 2 SGs in the future to include Row 3. All U-Bend PWSCC met condition monitoring performance criteria.

Volumetric Indications

Two tubes were plugged with volumetric indications at HTS. The limiting indication was 0.22" axial and 90° circumferential length. The indication was sized as 61% maximum depth and 38.64% average depth. The calculated burst pressure is 5838 psi, which is well within structural limits. The maximum voltage was 1.02. With this voltage and maximum depth, no leakage would be expected even in accident conditions.

Other Plugged Tubes

Nine tubes were plugged preventively for the following reasons:

⇒ 2 tubes were plugged due to incomplete tests in large dents
⇒ 3 tubes were plugged that were characterized as U-Bend geometry
⇒ 2 tubes were plugged because they had no tubesheet expansion
⇒ 1 tube was plugged due to permiability
⇒ 1 tube was plugged for flow lane blocking device wear measured at 20%

SECONDARY SIDE INSPECTION SCOPE AND RESULTS

Cracked Support Plate Indications

Cracked tube support plate indications are indications of cracks in the tube support plates and not necessarily indicative of tube degradation. These are detected during 100% automated analysis of bobbin data.

SQN unit 2 SGs do not have extensive support plate cracking. Cracked TSPs were evaluated for potential star drop-out conditions and none were identified. Therefore, design basis function of the support plate has not been lost. There is also no evidence of wrapper drop or wrapper degradation.

Upper Internals Inspection

Upper internals inspection was performed on SG 1 and no degradation was detected.

Sludge Lancing

Sludge lancing was performed on all four SGs: 29 pounds of sludge was removed from SG1, 37 pounds from SG2, 34 pounds from SG3, and 30 pounds from SG4. A post-lance inspection confirmed that the top of the tubesheet on all generators was clean.

Foreign Object Search and Retrieval (FOSAR)

Foreign object search and retrieval was completed on all four SGs prior to closure and all identified foreign objects were retrieved. No tube wear was associated with removed foreign objects.

CONCLUSIONS

The nondestructive testing completed on the SQN Unit 2 SGs and plugging of defective tubes met the Technical Specification and ASME Section XI code requirements for inservice inspection and structural and leakage integrity has been demonstrated; therefore, each SG has been demonstrated operable.

Alternate Repair Criteria was implemented in accordance with the Unit 2 Technical Specification.

Based on the criteria of 10 CFR 50.59 and utilizing the criteria of Draft Regulatory Guide 1.121, TVA concludes that the integrity of the SQN Unit 2 SGs was maintained during Cycle 10 operation and will be maintained through full Cycle 11 operation and does not represent an unreviewed safety question.

Attachment 1
Sequoyah Nuclear Plant
Unit 2 Cycle 10 Steam Generator Inspection
Ninety-Day Report

Condition Monitoring and Operational Assessment for Generic Letter 95-05 Alternate Repair Criteria. This report satisfies SQN Nuclear Plant's commitment to report the following information ninety days after restart.

Reporting Requirement	Section of Report
1. Results of metallurgical examinations of tube intersections removed from the unit	N/A
2. End of cycle (EOC) voltage distribution	3.1
3. Cycle voltage growth rate distribution	3.2
4. Voltage distribution for EOC repaired indications	Indications Table Attachment 2 Tables 3.1-3.4
5. Voltage distribution for indications left in service at the beginning of cycle 11	7.2
6. Voltage distribution for indications left in service at the beginning of cycle 11 confirmed by RPC	Indications Table Attachment 2
7. Nondestructive examination uncertainty distribution used in predicting the EOC voltage distribution	5.5
8. Conditional probability of burst during MSLB	6.2 & 7.5
9. Total leak rate during MSLB evaluation	6.2 & 7.5

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1.0 Introduction

SQN Unit 2 completed the tenth cycle of operation and subsequent SG tube inspection November 2000. Axial ODSCC has been confirmed within the TSP regions of the SGs and is a current degradation mechanism at SQN Unit 2. The alternate repair criterion (ARC) defined in NRC Generic Letter 95-05 (Reference 1) has been implemented at SQN Unit 2 for several operational cycles (References 2,3,4).

This report provides a condition monitoring assessment that demonstrates that the GL 95-05 acceptance criteria are satisfied at the end of operational cycle 10 (EOC-10), and an operational assessment that demonstrates that the GL 95-05 acceptance criteria is expected to continue to be satisfied throughout operational cycle 11.

The operation cycle just completed, cycle 10, was 521.4 Effective Full Power Days (EFPD). The next cycle, cycle 11, is estimated to be 506 EFPD.

2.0 Summary and Conclusions

Bobbin voltage indications of ODSCC at the TSPs were detected and measured in all four SGs. Based on this voltage distribution, using the methodology of References 1 and 5, a condition monitoring evaluation including the computation of the probability of tube burst (POB) and the amount of leakage predicted for steam line break conditions at EOC-10 was performed. The acceptance criteria on POB and leakage are satisfied with significant margin. The results also indicated that the predictions for EOC-10, Reference 4, were reasonable and conservative for POB and leakage for all four SGs.

For each indication detected, the change in voltage from the previous inspection was determined by historical review. The apparent growth rate per EFPY was determined for each SG, and was not significantly different from the apparent growth during cycle 9. Although there were not significant differences in the voltage growth rates among the SGs, the larger of the generator specific growth or the composite of all SGs for either cycle 9 or 10 was used for the operational assessment prediction for EOC-11. The prediction of the POB and leakage at steam line break conditions at EOC-11 was performed. The results indicate that the acceptance criteria on POB and leakage at EOC-11 are satisfied with significant margin. Therefore the Reference 1 acceptance criteria will be satisfied throughout cycle 11.

3.0 EOC-10 Inspection Results

3.1 Voltage Distributions at EOC-10

A summary of eddy current signal voltage distributions at the drilled support plates for all SGs is shown in Tables 3.1 through 3.4 for SGs 1 through 4 respectively. These tables show the number of indications in each voltage range detected at EOC-10 and the number of indications removed from service due to tube repairs for any reason. The number of indications that remain in service for Cycle 11 is the difference between the number detected and those removed from service. No tubes were unplugged with the intent to return them to service after inspection.

The summary of all four SGs is as follows:

- A total of 924 bobbin signals were identified as TSP indications during the inspection that were called DSIs.
- Of the 924 DSIs, none were equal to or greater than 2 volts.
- No tubes were plugged due to ODSCC at the support plates.
- 10 indications were plugged for reasons other than ODSCC at the support plates.

Table 3.1
Inspection Results for SG 1

	CY 10	Indications	Returned to Service
Voltage Bin	Inservice	Repaired	CY 11
0.1	0		1
0.2	11		11
0.3	19		19
0.4	22		22
0.5	21		21
0.6	11	1	10
0.7	7		7
0.8	4		4
0.9	7	1	6
1	2		2
1.1	2		2
1.2	1		1
1.3	0		0
1.4	0		0
1.5	1		1
1.6	1		1
1.7	0		0
1.8	0		0
1.9	0		0
2	0		0
2.1	0		0
2.2	0		0
2.3	0		0
2.4	0		0
2.5	0		0
TOTAL	109	2	107

Table 3.2
Inspection Results for SG 2

	CY 10	Indications	Returned to Service
Voltage Bin	Inservice	Repaired	CY 11
0.1	0		0
0.2	5		5
0.3	15		15
0.4	27		27
0.5	13		13
0.6	17	1	16
0.7	11		11
0.8	11		11
0.9	7		7
1	11		11
1.1	3		3
1.2	6		6
1.3	0		0
1.4	1		1
1.5	0		0
1.6	0		0
1.7	1		1
1.8	0		0
1.9	1		1
2	0		0
2.1	0		0
2.2	0		0
2.3	0		0
2.4	0		0
2.5	0		0
TOTAL	129	1	128

Table 3.3
Inspection Results for SG 3

	CY 10	Indications	Returned to Service
Voltage Bin	Inservice	Repaired	CY 11
0.1	0		0
0.2	2		2
0.3	12		12
0.4	17		17
0.5	19	1	18
0.6	21		21
0.7	15		15
0.8	16		16
0.9	9		9
1	10		10
1.1	6		6
1.2	5		5
1.3	5		5
1.4	0		0
1.5	1		1
1.6	0		0
1.7	1		1
1.8	1		1
1.9	1		1
2	2		2
2.1	0		0
2.2	0		0
2.3	0		0
2.4	0		0
2.5	0		0
TOTAL	143	1	142

Table 3.4
Inspection Results for SG 4

	CY 10	Indications	Returned to Service
Voltage Bin	Inservice	Repaired	CY 11
0.1	2		2
0.2	21		21
0.3	78		78
0.4	88		88
0.5	91	1	90
0.6	99	3	96
0.7	58	1	57
0.8	36		36
0.9	28		28
1	20	1	19
1.1	7		7
1.2	6		6
1.3	2		2
1.4	2		2
1.5	2		2
1.6	2		2
1.7	0		0
1.8	1		1
1.9	0		0
2	0		0
2.1	0		0
2.2	0		0
2.3	0		0
2.4	0		0
2.5	0		0
TOTAL	543	6	537

3.2 Voltage Growth Rates for Cycle 10

The voltage growth for each indication detected at EOC-10 was determined by identifying the corresponding voltage at the previous inspection, EOC-9. The following process was used to determine the EOC-9 voltage:

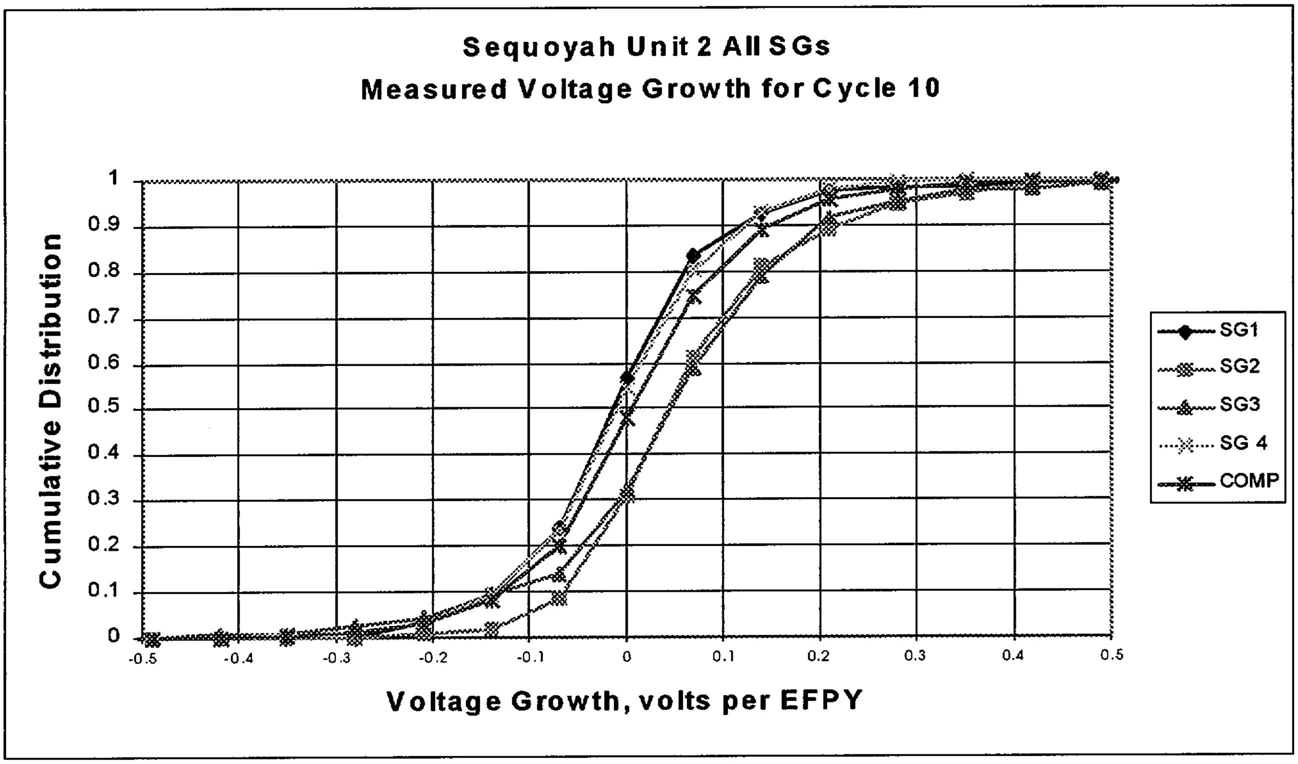
- If the indication was called a PI at EOC-9, then the reported voltage is used.
- If the indication was not called a PI at EOC-9, then a re-evaluation of the historical data of the corresponding EOC-9 inspection result was made.

The distribution of voltage differences over the entire cycle is shown in Table 3.5 for all four SGs. A comparison of the growth rates for each SG on an EFPY basis is determined by dividing by the EFPY of Cycle 10. This comparison is shown in Figure 3.1. Also shown in Figure 3.1 is the Cycle 10 composite curve, which is the growth for all four SGs combined.

Table 3.5
Voltage Changes from EOC-9 to EOC-10

	Number of Indications			
Voltage Bin	**SG 1**	**SG 2**	**SG 3**	**SG 4**
-0.8	0	0	0	0
-0.7	0	0	0	0
-0.6	0	0	1	0
-0.5	0	0	0	4
-0.4	0	0	3	4
-0.3	4	1	2	9
-0.2	6	1	8	35
-0.1	16	9	6	75
0	36	29	26	170
0.1	29	39	38	140
0.2	10	26	29	67
0.3	5	10	18	27
0.4	1	7	5	9
0.5	0	3	4	2
0.6	1	3	0	1
0.7	0	0	2	0
0.8	0	0	1	0
0.9	1	0	0	0
1	0	1	0	0
1.1	0	0	0	0
1.2	0	0	0	0

Figure 3.1



The voltage growth rates in volts per EFPY for all of the SGs are shown in Table 3.6.

Table 3.6
Average and 95th Percentile
Cycle 10 Growth Rates per EFPY

Steam Generator	Average Voltage Growth per EFPY in Cycle 10	95th Percentile Growth per EFPY in Cycle 10
1	-0.003	0.176
2	0.064	0.293
3	0.051	0.279
4	-0.005	0.170
Composite	0.014	0.204

4.0 Comparison of Predicted and Measured Voltage Distributions at EOC-10

4.1 Comparison of Voltage Distributions

The voltage distribution measured at EOC-10 is compared to the voltage distribution predicted in Reference 4 for each SG in Figures 4.1 through 4.4. In SGs 1,3,and 4 there are fewer indications than predicted. In all SGs, the maximum measured voltage is lower than the prediction.

Figure 4.1

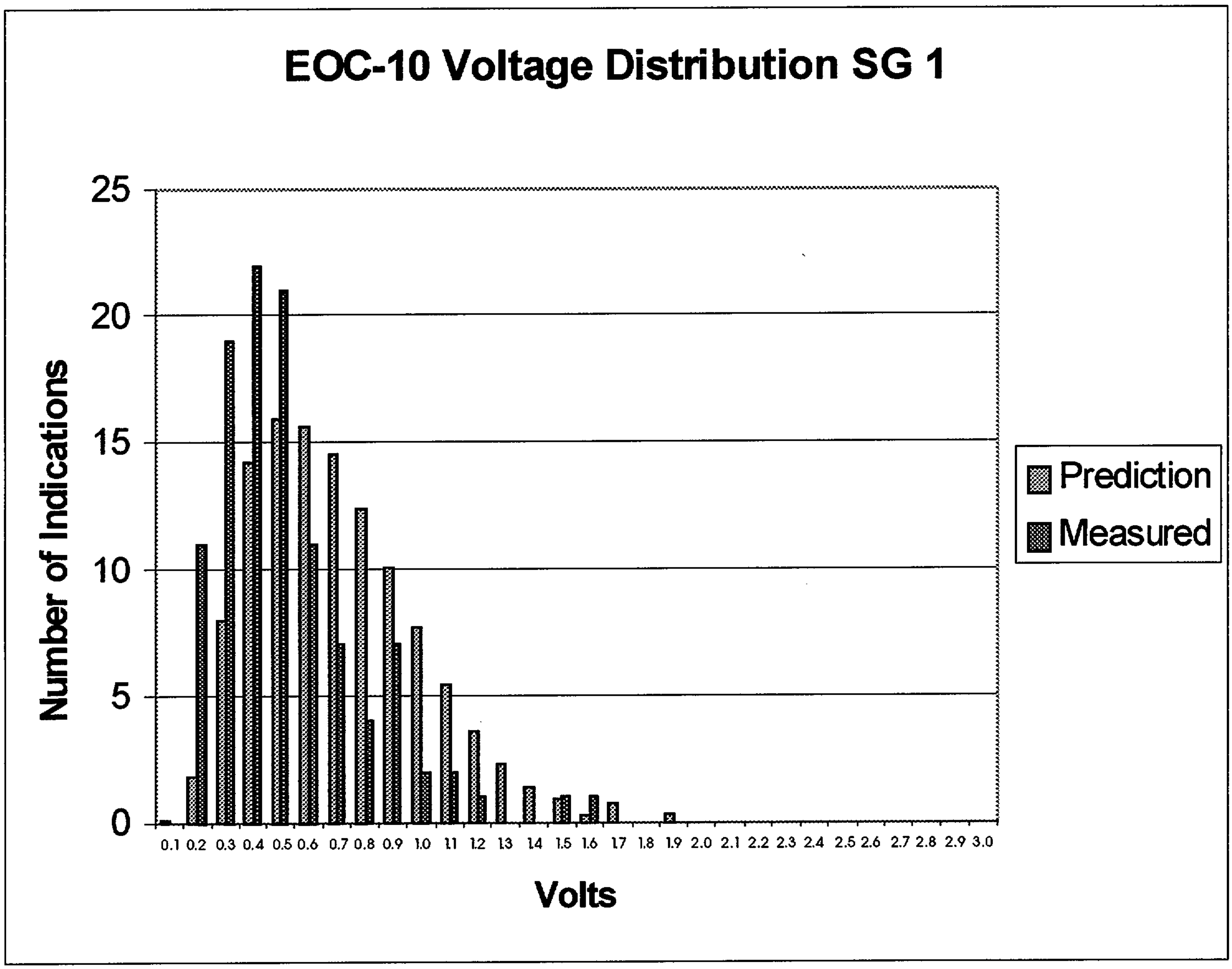


Figure 4.2

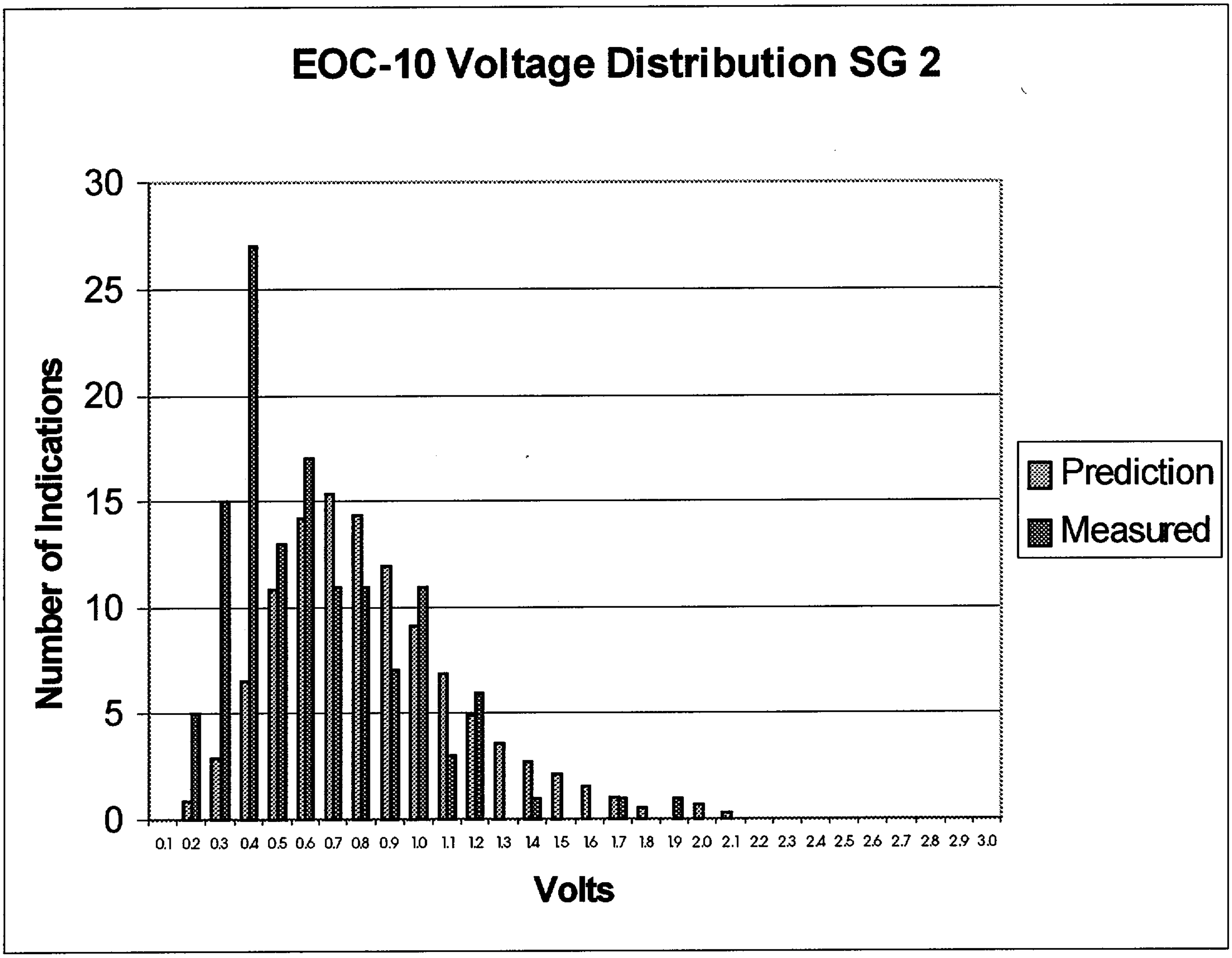
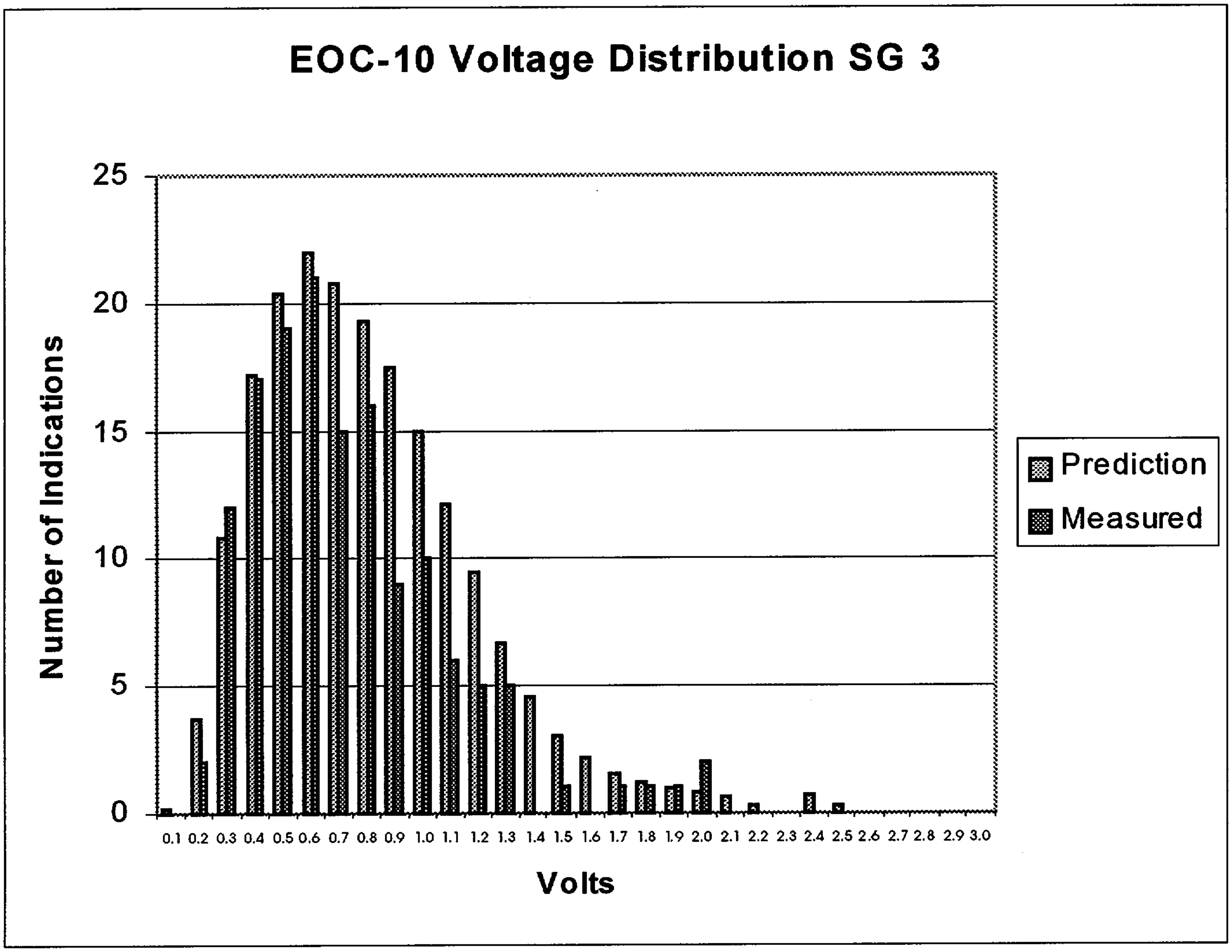
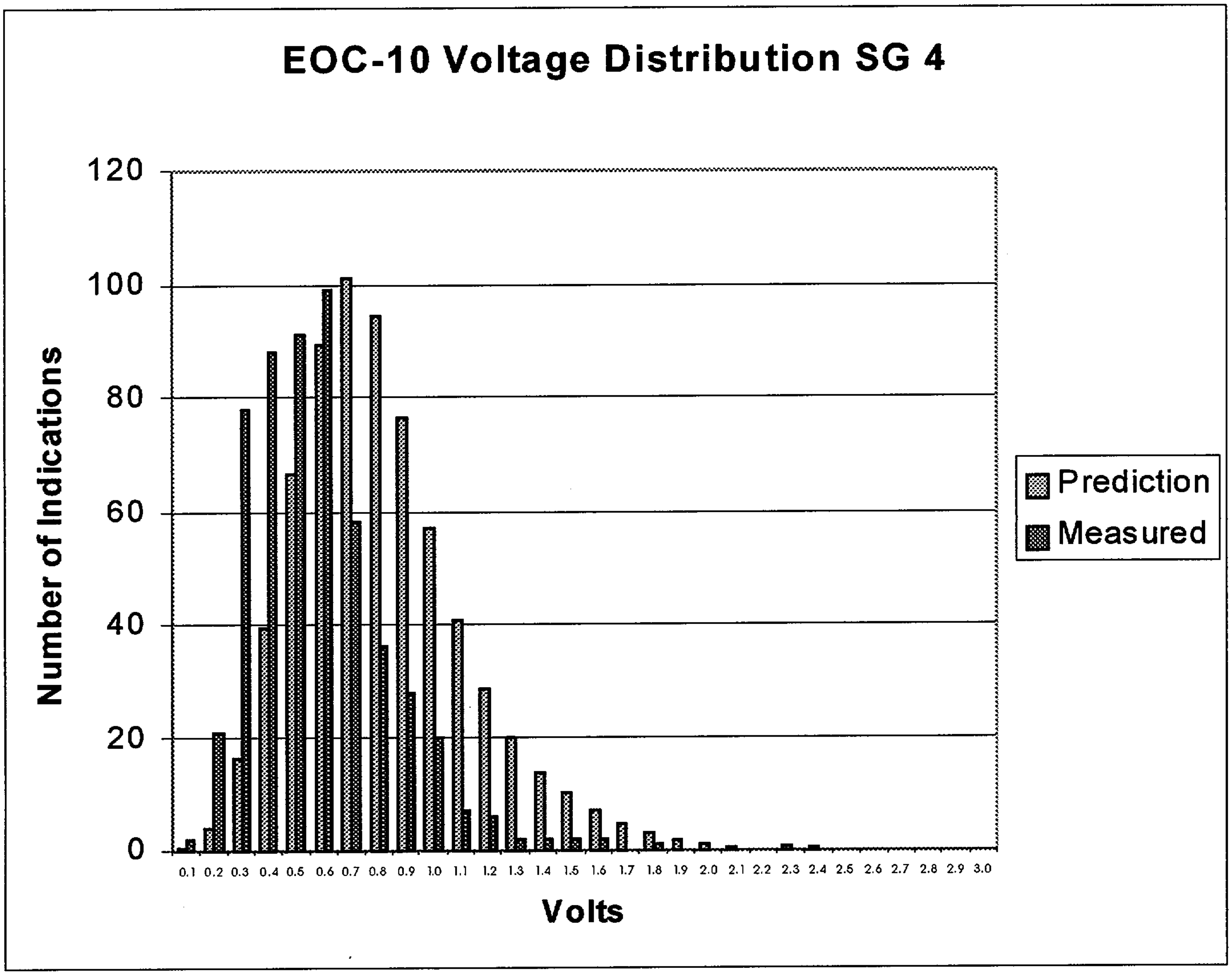

EOC-10 Voltage Distribution SG 2
Number of Indications
0
5
10
15
20
25
30
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
Volts
Prediction
Measured

Figure 4.3



EOC-10 Voltage Distribution SG 3
Number of Indications
25
20
15
10
5
0
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0
Volts
Prediction
Measured

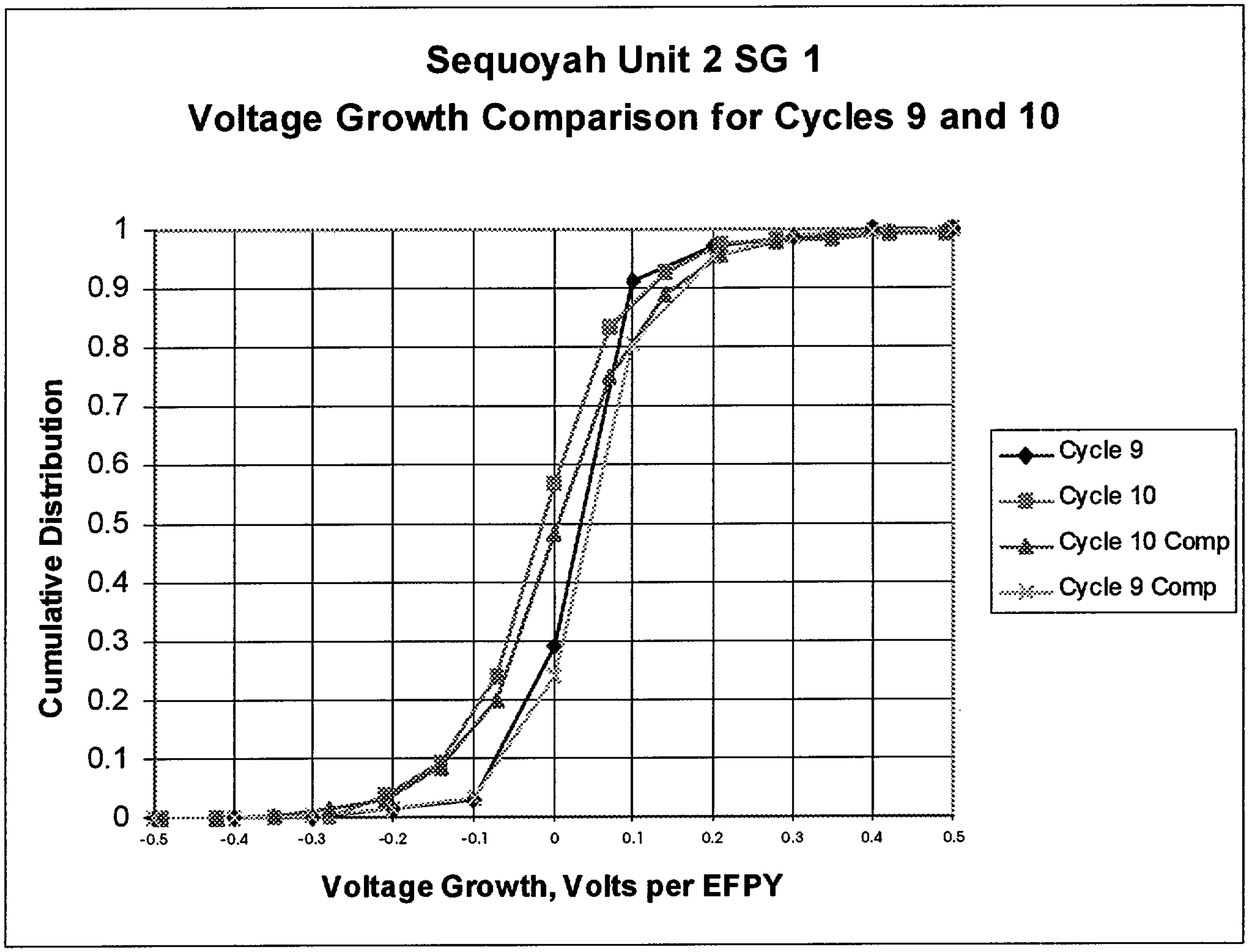
Figure 4.4



4.2 Comparison of Voltage Growth Distributions

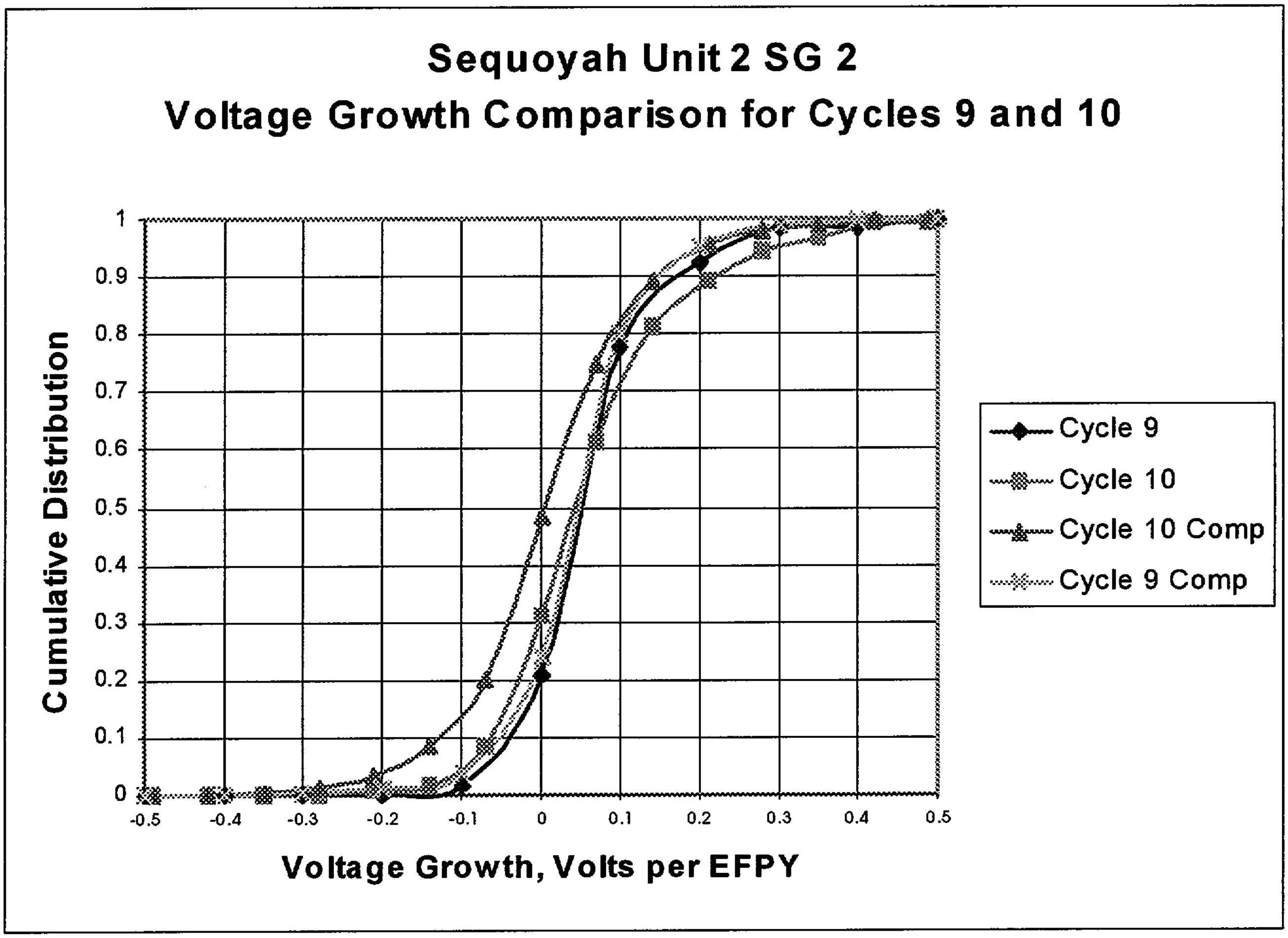
The voltage growth distributions developed in Section 3.2 for Cycle 10, are compared with the corresponding growth distribution of Cycle 9 (Reference 4). Figures 4.5 through 4.8 show the comparisons of the SG specific and composite (average of all four SGs) growth for SG1 through SG4, respectively.

Figure 4.5



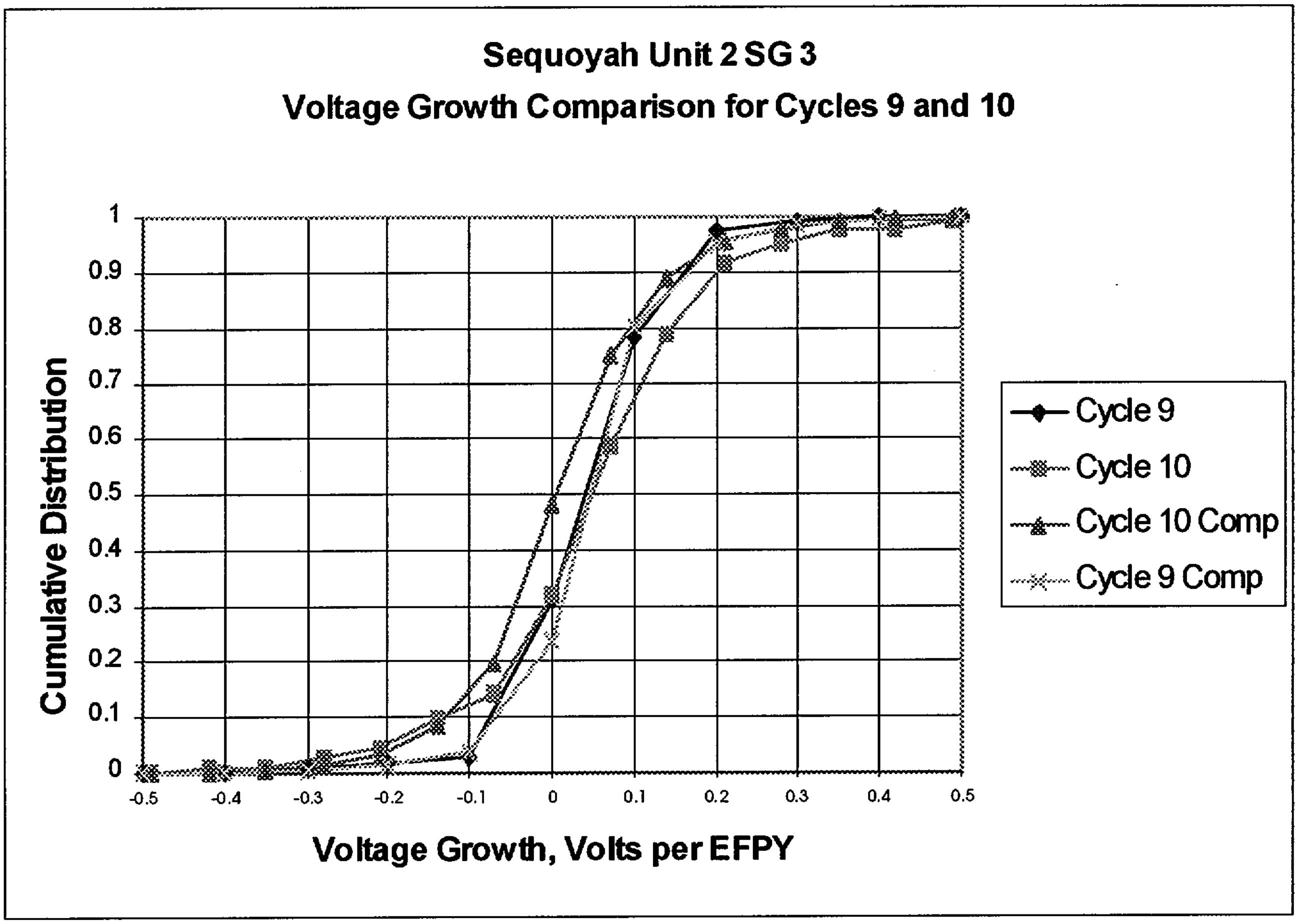
For SG 1, the cycle 9 composite is conservative and will be used.

Figure 4.6



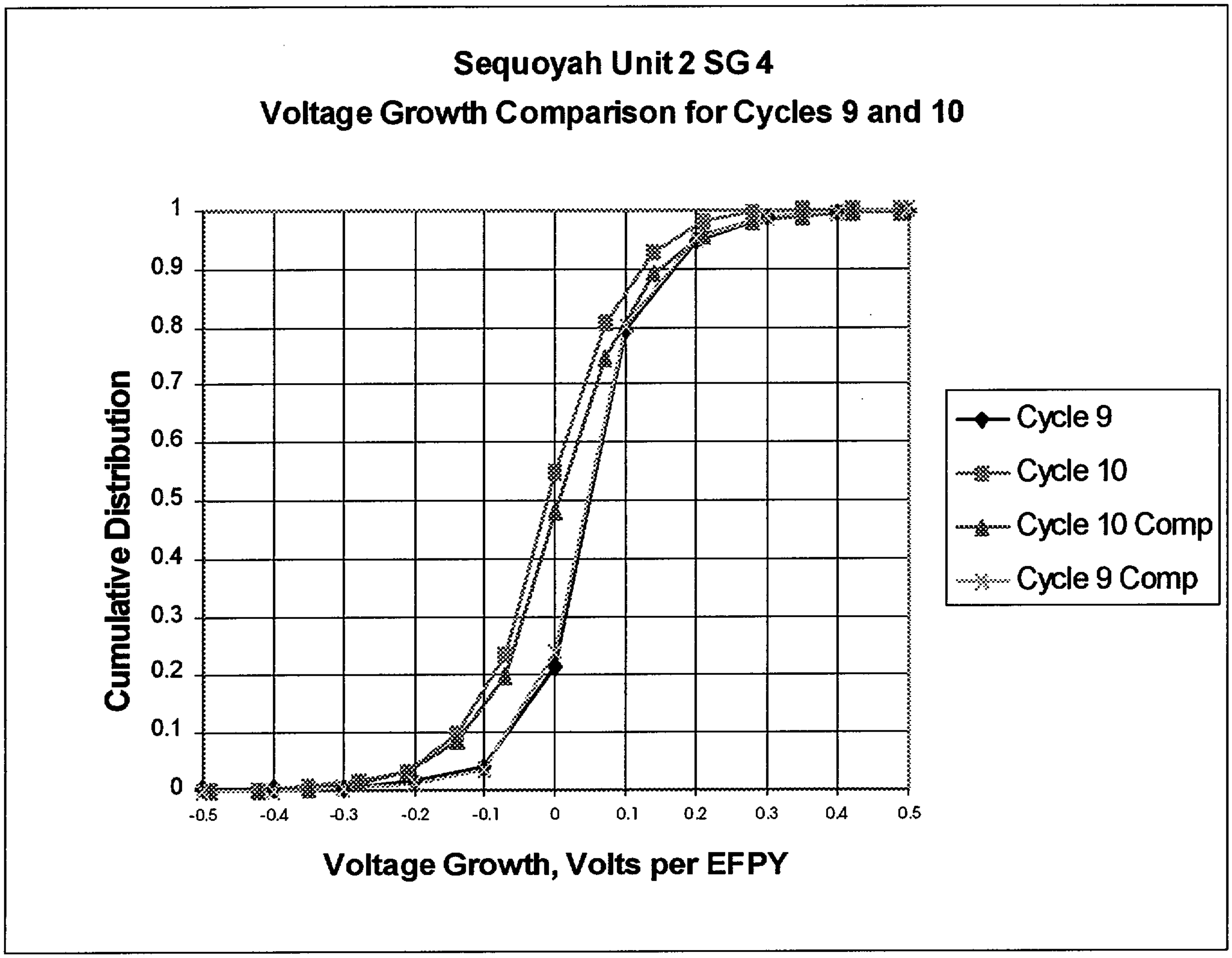
For SG 2, the cycle 10 SG specific rate is conservative and will be used.

Figure 4.7



For SG 3, the cycle 10 SG specific rate is conservative and will be used.

Figure 4.8



For SG 4, the cycle 9 SG specific rate is conservative and will be used.

A summary of the average and 95th percentile growth rates chosen for the cycle 9 prediction for each SG is presented in Table 4.1.

Table 4.1
Comparison of Voltage Growth Rates of Cycle 9 and Cycle 10
Average and 95th Percentile
Growth Rates per EFPY

Steam Generator	Average Voltage Growth per EFPY in Cycle 9	Average Voltage Growth per EFPY in Cycle 10	Growth Rate Chosen	Average Voltage Growth per EFPY in Cycle 11 Prediction
1	0.046	-0.003	CY-9 Comp	0.069
2	0.089	0.064	CY-10 SG 2	0.064
3	0.065	0.051	CY-10 SG 3	0.051
4	0.071	-0.005	CY-9 SG 4	0.071
Composite	0.069	0.014		

Steam Generator	95th Percentile Growth per EFPY in Cycle 9	95th Percentile Growth per EFPY in Cycle 10	Growth Rate Chosen	95th Percentile Growth per EFPY in Cycle 11 Prediction
1	0.164	0.176	CY-9 Comp	0.199
2	0.241	0.293	CY-10 SG 2	0.293
3	0.188	0.279	CY-10 SG 3	0.279
4	0.210	0.170	Cy-9 SG 4	0.210
Composite	0.199	0.204		

5.0 Analysis Methods and Data Base for ARC Correlations

A Monte Carlo based computer program was used to perform the calculations prescribed in GL 95-05 (Reference 1). The methodology for predicting the EOC voltage distribution and computing the POB and leakage at accident conditions is based on the Westinghouse Topical Report, WCAP-14277, Revision 1 (Reference 5).

The predictions for EOC-10 recorded in Reference 4 used the tube burst and leakage correlations of Addendum 2 to EPRI Report NP-7480-L (Reference 7). Recently, additional data has been added to the database that slightly affects the burst correlation and the probability of leak correlation. The new data is included in Addendum 3 to EPRI Report NP-7480-L (Reference 8). The new Addendum 3 database results in a slightly lower best fit burst correlation, and a slightly lower standard error. This results in a lower POB for cases where the POB is less than 1×10^{-4} because of the reduced uncertainty in the correlation. The leakage is only slightly affected.

In order to maintain continuity in the analysis results, the condition monitoring assessment was performed using the Addendum 2 database to be consistent with the basis for the EOC-10 prediction. The operational assessment of the predicted EOC-11 voltage distribution was performed using the Addendum 3 database. The specific parameters used in the correlations are provided in Sections 5.1 through 5.4.

5.1 Tube Material Properties

The tube material properties are provided in Reference 5 for 7/8 inch diameter tubes at 650F. The parameters used in the analysis are the flow stress mean of 68.78 Ksi and the flow stress standard deviation of 3.1725 Ksi.

5.2 Burst Correlation

The burst pressure, Pb, is normalized to a material with a flow stress of 68.78 ksi, which is the mean of the 7/8 inch tube data and appropriate for SQN Unit 2.

Pb = a0 + a1 Log(Volts)

Parameter	Addendum 2 Database	Addendum 3 Database
a0	7.58911 Ksi	7.57661 Ksi
a1	-2.40111	-2.39816
Standard error	0.826524	0.823889
Number of data points	85	91
Reference Flow Stress	68.78 Ksi	68.78 Ksi
Covariance Coefficient V11	.0097024	.0087443
Covariance Coefficient V12	-.0049221	-.00422648
Covariance Coefficient V22	0.0145469	.0139006

5.3 Leak Rate Correlation

The leak rate criterion is given in terms of gallons per minute condensed at room temperature. The correlation formula provides leak rate in liters per hour at a pressure of 2560 psi. In order to obtain gallons per minute condensed at room temperature the leak rate Q in the correlation equation must be multiplied by the conversion factor 0.004403. Addendum 3 did not change the leak rate correlation.

$$Log(Q) = b3 + b4\ Log(Volts)$$

Parameter	Addendum 2 Database
b3	-0.526882
b4	0.987179
Standard error	0.808109
Number of data points	29
Covariance Coefficient V11	0.385504
Covariance Coefficient V12	-0.314445
Covariance Coefficient V22	0.272396

5.4 Probability of Leak Correlation

The probability of leak as a function of indication voltage is revised in Reference 8. In the Monte Carlo analysis, leakage is quantified only if the indication is computed to be a leaker, based on the probability of leak correlation.

Pr(Leak) = 1/{1+ e^[b1 + b2 Log(Volts)]}

Parameter	Addendum 2 Database	Addendum 3 Database
b1	-4.26272	-4.31326
b2	4.16746	4.21125
Number of data points	130	137
Covariance Coefficient V11	.68535	.67152
Covariance Coefficient V12	-.60365	-.59145
Covariance Coefficient V22	0.60210	.59172

5.5 NDE Uncertainties

The NDE uncertainties applied for the EOC-10 and EOC-11 voltage projections are the same as given in the prior SQN Unit 2 90 Day reports, References 2 through 4. The probe wear uncertainty has a standard deviation of 7% about a mean of zero and has a cutoff at 15% based on implementation of the probe wear standard. The analyst variability uncertainty has a standard deviation of 10.3% about a mean of zero with no cutoff. These NDE uncertainty distributions are used in the Monte Carlo analysis to predict the burst probabilities and accident leak rates at EOC-10 and EOC-11.

6.0 Condition Monitoring

6.1 Analysis Approach

The measured EOC-10 voltage distributions of Table 3.1 through 3.4 for each SG are used as the basis for the leak rate and burst probability predictions for EOC-10. The voltage distributions predicted consider NDE uncertainty on the measured values, but consider no voltage growth. For a more direct comparison with the previous predictions for EOC-10 (Reference 4), the burst and leak correlations used (Reference 7) are the same as those used in Reference 4.

6.2 EOC-10 Burst Probabilities and Leak Rates

The predicted results from Reference 4 for each of the SGs at EOC-10 are shown in Table 6.1. The leakage rate is the 95th percentile evaluated at 95% confidence. The burst probability is the probability of burst of one or more tubes at 95% confidence based on the number of trials.

Table 6.1
Predicted Results from Reference 4

SG	Number of Indications	Max Volts	Burst Probability	SLB Leak Rate, gpm
1	115.0	1.9	1.2x 10^-5	0.09
2	110.7	2.1	1.9x 10^-5	0.12
3	191.3	2.6	1.2x 10^-5	0.24
4	677.3	2.4	4.7x 10^-5	0.94

The Monte Carlo analysis results for each of the SGs based on the measured voltage distribution at EOC-10 are shown in Table 6.2. One million Monte Carlo trials were performed for each SG. The leakage rate is the 95th percentile evaluated at 95% confidence. The burst probability is the POB of one or more tubes at 95% confidence based on the number of trials. Calculation details are documented in Reference 9.

Table 6.2
Monte Carlo Analysis Results for Measured EOC-10 Voltage Distributions

SG	Number of Trials	Number of Indications	Max Volts Measured	Number of bursts	Burst Probability 95% Conf.	SLB Leak Rate, gpm 95/95
1	1,000,000	109	1.58	1	0.48×10^{-5}	0.053
2	1,000,000	129	1.86	3	0.77×10^{-5}	0.105
3	1,000,000	143	1.93	8	1.44×10^{-5}	0.161
4	1,000,000	543	1.73	11	1.82×10^{-5}	0.437

6.3 Comparison with Acceptance Criteria

The results indicate that the predictions for EOC-10 were conservative for POB for all but SG 3, and conservative for leakage for all four SGs. The computed POB of 1.44×10^{-5} for SG 3 is slightly higher than the prediction of 1.2×10^{-5}, but this difference is well within the predictive uncertainty of the analysis process. All SGs are well below the burst acceptance criterion of 1.0×10^{-2}, and the SQN Unit 2 leakage criterion of 8.2 gpm. The acceptance criteria on POB and leakage are satisfied with significant margin.

7.0 Operational Assessment

7.1 Analysis Approach

The BOC-11 voltage distribution is developed from the measured distribution by considering the probability of detection (POD) and the indications that are removed from service. The EOC-11 voltage distribution is developed considering the NDE uncertainties and voltage growth during the cycle. The latest burst and leakage correlations, Reference 8, are used for the EOC-11 predictions. The burst probabilities and leak rates are computed using the computed EOC-11 voltage predictions to address the acceptance criteria at the end of the cycle.

7.2 BOC Voltage Distribution

The BOC-11 voltage distribution for each SG is determined from the measured EOC-10 voltage distribution. First, the number of indications potentially missed during the inspection and the number of new indications initiating during the Cycle 11, are considered by dividing the measured number of indications in each voltage range by the assumed POD. From this number of indications in each voltage range is subtracted the number of indications removed from service for any reason. This then gives the BOC-11 voltage distribution.

7.2.1 POD

The POD used is the NRC accepted value of 0.6 for all voltages (Reference 1).

7.2.2 Tube Repairs

Considering the repaired tubes and the POD, the BOC-11 voltage distribution for each SG is given in Table 7.1

Table 7.1
BOC-11 Voltage Distributions for all SGs

Voltage Bin	SG 1	SG 2	SG 3	SG 4
0.1	0	0	0	3.33
0.2	18.33	8.33	3.33	35.00
0.3	31.67	25.00	20.00	130.00
0.4	36.67	45.00	28.33	146.67
0.5	35.00	21.67	30.67	150.67
0.6	17.33	27.33	35.00	162.00
0.7	11.67	18.33	25.00	95.67
0.8	6.67	18.33	26.67	60.00
0.9	10.67	11.67	15.00	46.67
1	3.33	18.33	16.67	32.33
1.1	3.33	5.00	10.00	11.67
1.2	1.67	10.00	8.33	10.00
1.3	0	0	8.33	3.33
1.4	0	1.67	0	3.33
1.5	1.67	0	1.67	3.33
1.6	1.67	0	0	3.33
1.7	0	1.67	1.67	0
1.8	0	0	1.67	1.67
1.9	0	1.67	1.67	0
2	0	0	3.33	0
2.1	0	0	0	0
2.2	0	0	0	0
2.3	0	0	0	0
2.4	0	0	0	0
2.5	0	0	0	0
2.6	0	0	0	0
2.7	0	0	0	0
TOTAL	179.67	214.00	237.33	899.00

7.3 Voltage Growth Rates for Cycle 11

The voltage growth rates for cycles 9 and 10 were compared in Section 4 and conservative rates were chosen for each SG. The voltage growth rate cumulative distribution used for the EOC 11 predictions for each SG is listed in Table 7.2.

Table 7.2
Cumulative Distribution of Selected Voltage Growth per EFPY for EOC-11 Predictions

SG 1 Voltage Growth per EFPY	SG1 Cumulation	SG 2 Voltage Growth per EFPY	SG2 Cumulation
0	0.2382	0	0.3101
0.1	0.8027	0.0700	0.6124
0.2	0.9514	0.1400	0.8140
0.3	0.9879	0.2100	0.8915
0.4	0.9970	0.2800	0.9457
0.5	0.9985	0.3500	0.9690
0.6	1.0	0.4200	0.9922
		0.4900	0.9922
		0.5600	0.9922
		0.6300	0.9922
		0.7000	1.0

SG 3 Voltage Growth per EFPY	SG3 Cumulation	SG 4 Voltage Growth per EFPY	SG 4 Cumulation
0	0.3217	0	0.2138
0.0700	0.5874	0.1	0.7936
0.1400	0.7902	0.2	0.9459
0.2100	0.9161	0.3	0.9877
0.2800	0.9510	0.4	0.9975
0.3500	0.9790	0.5	0.9975
0.4200	0.9790	0.6	1.0
0.4900	0.9930		
0.5600	1.0		

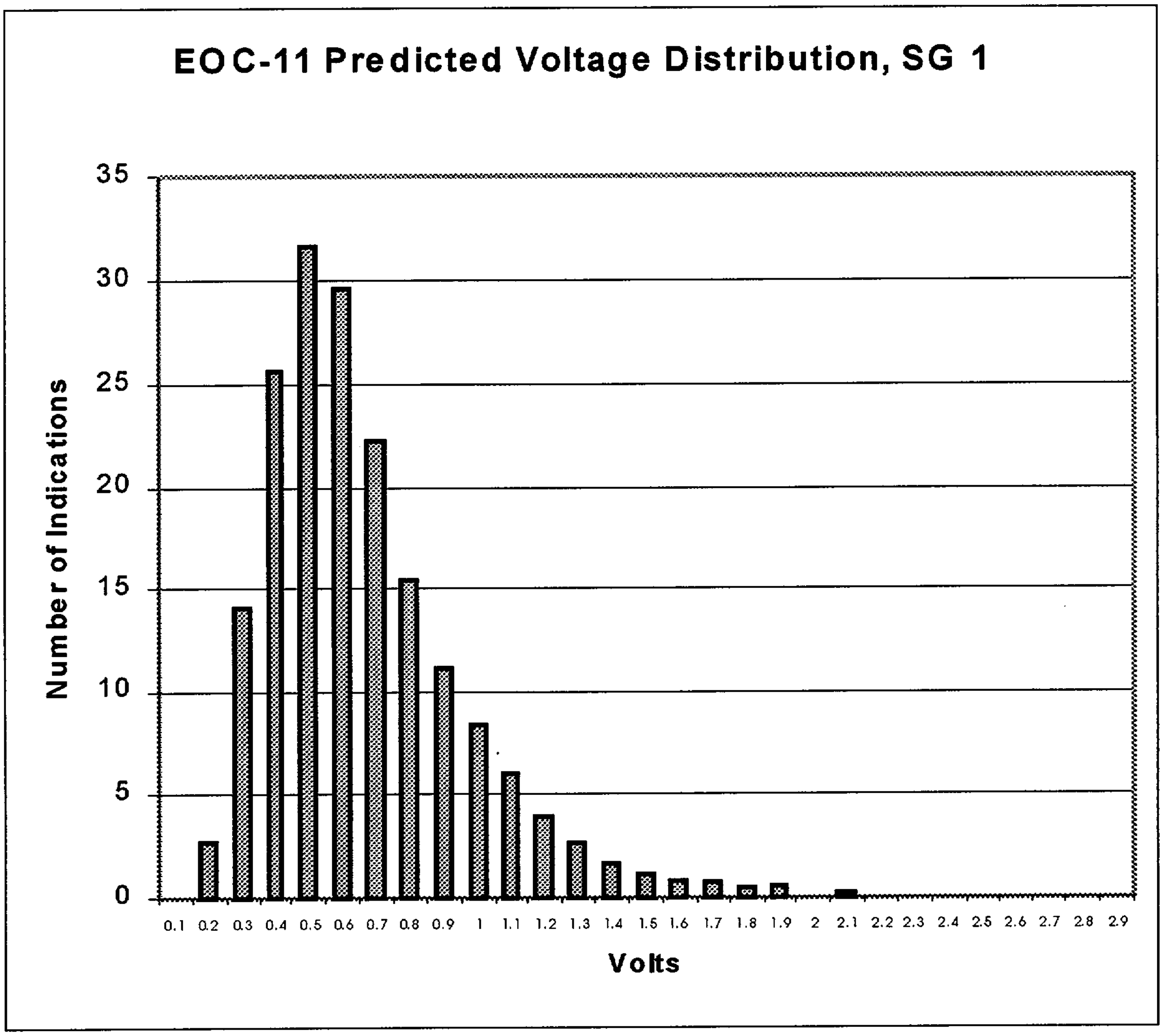
7.4 Prediction of Voltage Distributions at EOC-11

Using the number of indications from Table 7.1, the growth distribution from Table 7.2, and the cycle length of 506 EFPD, the prediction of the EOC-11 voltage distribution is made for each SG. The EOC-11 predicted voltage distributions for each SG are listed in Table 7.3 and shown in Figures 7.1 through 7.4. Calculation details are documented in Reference 9.

Table 7.3
EOC-11 Predicted Voltage Distributions for all SGs

Voltage Bin	SG 1	SG 2	SG 3	SG 4
0.1	0	0	0	0.45
0.2	2.77	1.49	0.60	6.98
0.3	14.20	8.38	5.23	39.71
0.4	25.56	20.96	14.24	95.22
0.5	31.64	27.59	21.68	127.82
0.6	29.65	26.15	26.90	142.29
0.7	22.24	24.11	28.42	135.36
0.8	15.47	21.49	27.03	108.57
0.9	11.19	18.78	23.93	79.48
1	8.37	16.24	20.27	56.13
1.1	6.01	13.43	16.70	38.19
1.2	4.04	10.61	13.36	24.77
1.3	2.58	7.86	10.30	15.52
1.4	1.66	5.43	7.54	9.72
1.5	1.17	3.52	5.27	6.26
1.6	0.93	2.29	3.62	4.20
1.7	0.74	1.54	2.60	2.89
1.8	0.55	1.11	2.03	2.00
1.9	0.6	0.85	1.72	1.34
2	0	0.66	1.48	0.87
2.1	0.3	0..50	1.24	0.8
2.2	0	0.6	0.99	0
2.3	0	0	0.74	0.4
2.4		0.4	0.53	0
2.5		0	0.6	0
2.6		0	0	0
2.7			0.35	
TOTAL	179.67	214.00	237.33	899.00

Figure 7.1



EOC-11 Predicted Voltage Distribution, SG 1
Number of Indications
35
30
25
20
15
10
5
0
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9
Volts

Figure 7.2

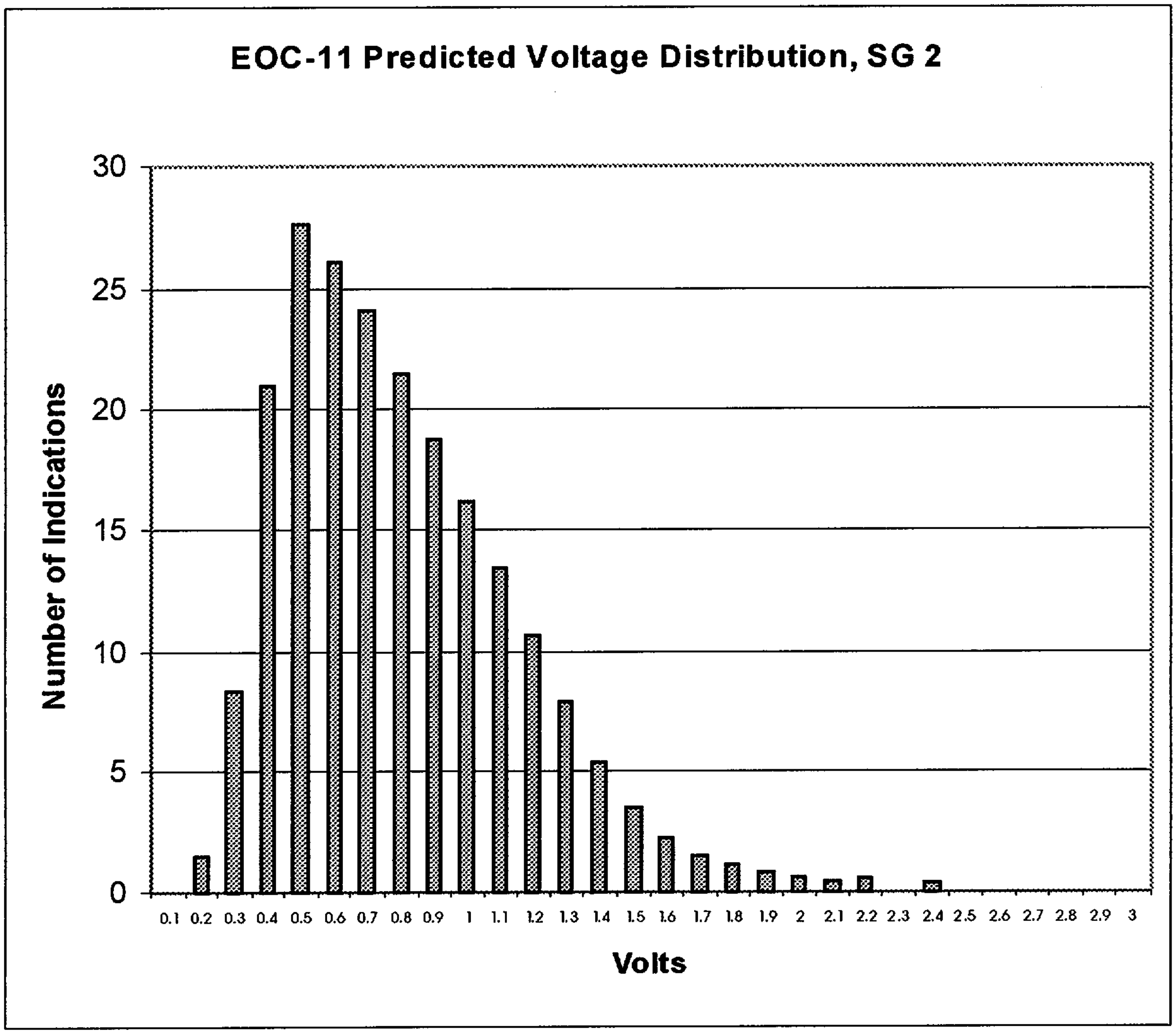
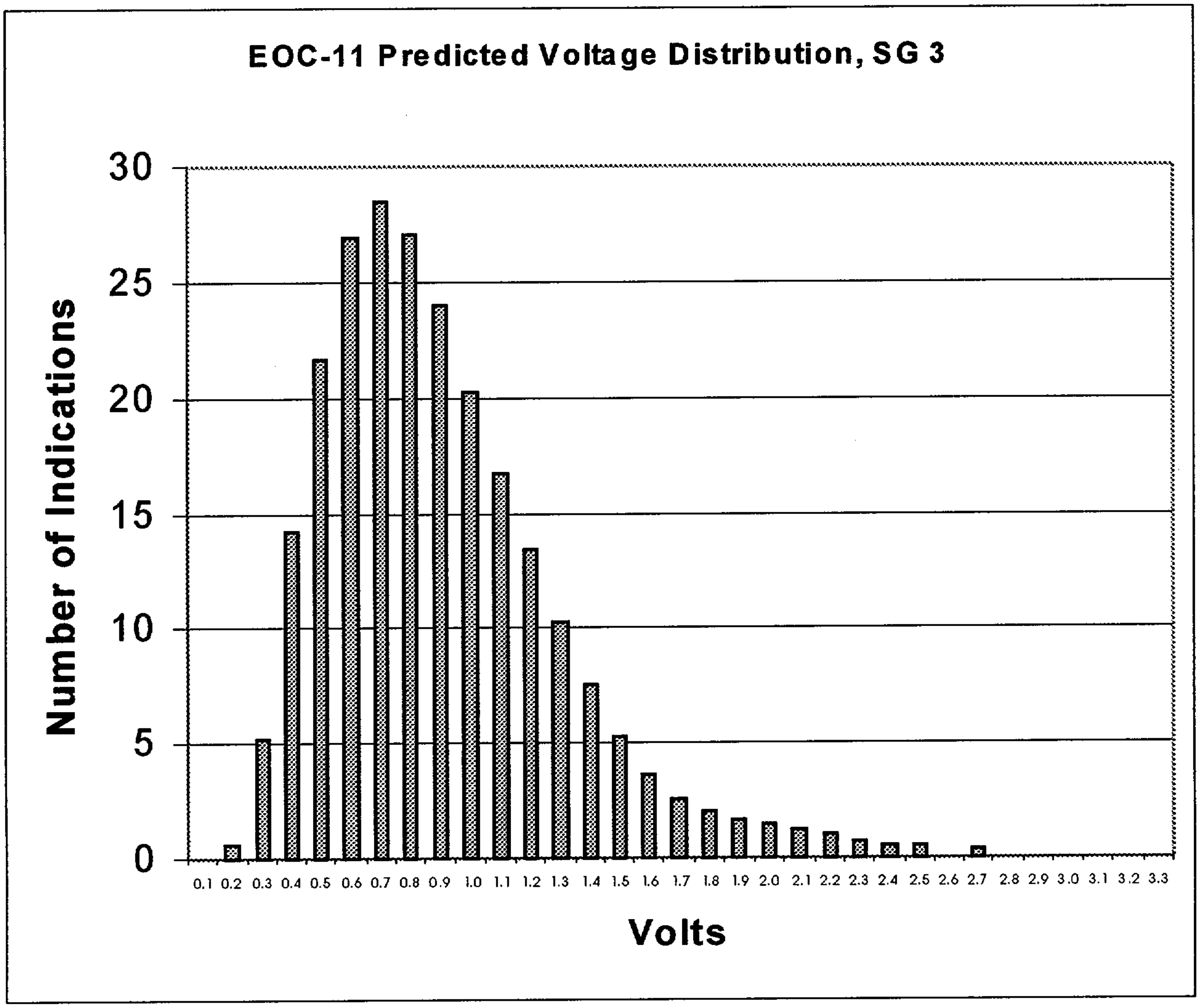
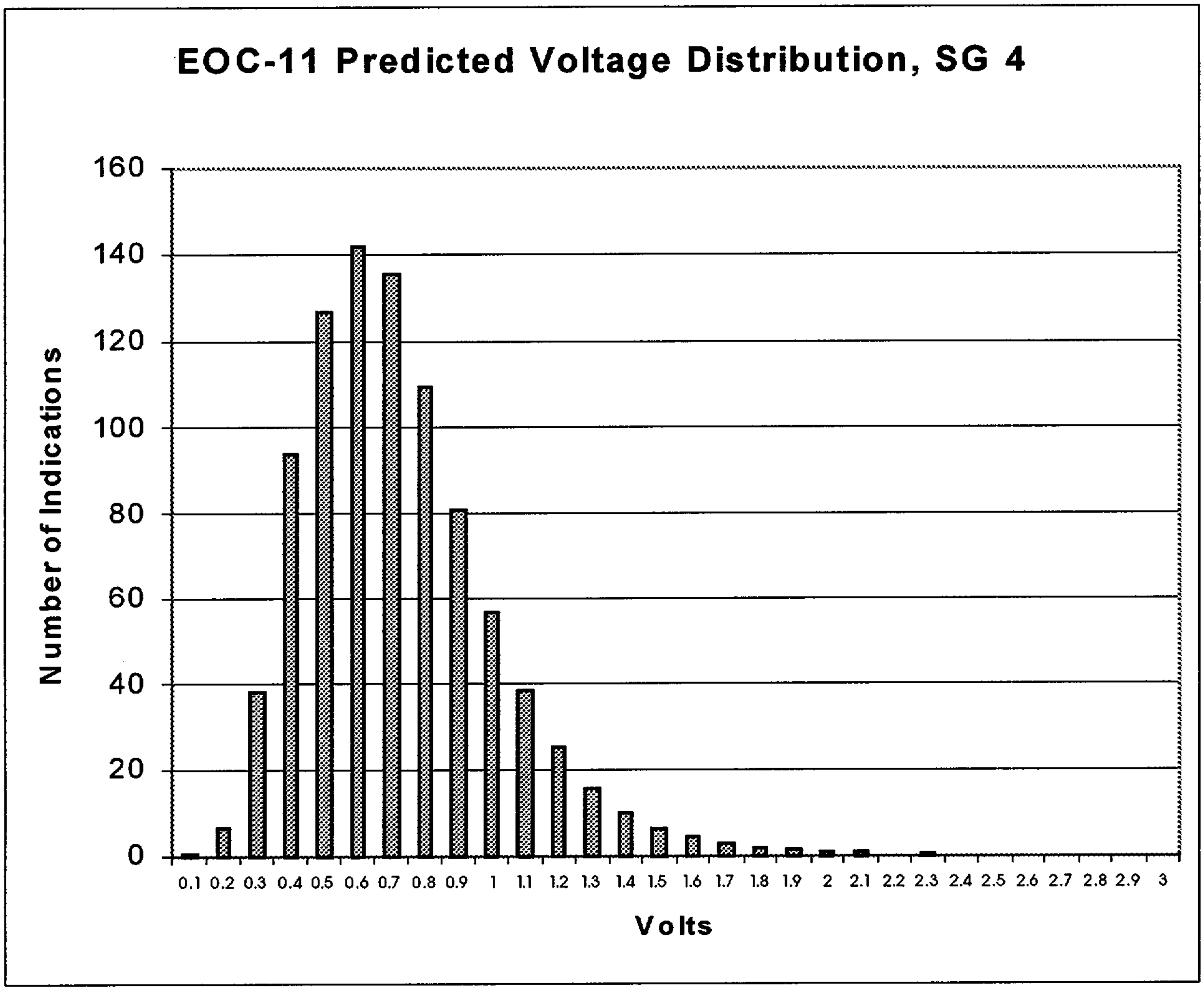

EOC-11 Predicted Voltage Distribution, SG 2
30
25
20
15
10
5
0
Number of Indications
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3
Volts

Figure 7.3



EOC-11 Predicted Voltage Distribution, SG 3
Number of Indications
0
5
10
15
20
25
30
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3
Volts

Figure 7.4



7.5 Prediction of Tube Leak Rates and Burst Probabilities at EOC-11

The Monte Carlo analysis results for predicted EOC-11 voltage distributions are shown in Table 7.3. One million Monte Carlo trials were performed for each SG. The leakage rate is the 95th percentile evaluated at 95% confidence. The burst probability is 95% confidence based on the number of trials.

Table 7.3
EOC-11 Predicted Results

Steam Gen.	Number of Monte Carlo Trials	Number of Indications	Max Volts*	Number of bursts	Burst Probability 95% conf.	95/95 SLB Leak Rate, gpm
1	1,000,000	179.67	2.1	5	1.05×10^{-5}	0.127'
2	1,000,000	214.00	2.4	10	1.69×10^{-5}	0.250
3	1,000,000	237.33	2.7	26	3.61×10^{-5}	0.361
4	1,000,000	899.00	2.3	11	1.82×10^{-5}	0.957

* Note. The maximum voltage is defined as the voltage where the integration of the voltage distribution from the tail reaches 0.3 of an indication

7.6 Comparison with Acceptance Criteria

All SGs are well below the burst acceptance criterion of 1.0×10^{-2}, and the SQN Unit 2 leakage criterion of 8.2 gpm.

8.0 References

1. NRC Generic Letter 95-05. "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking", USNRC Office of Nuclear Reactor Regulation, August 3, 1995.

2. SG-96-08-010, "Sequoyah Unit-2 Cycle 8 Alternate Plugging Criteria 90-Day Report," Westinghouse Nuclear Services Division, August 1996.

3. SG-98-01-002, "Sequoyah Unit-2 Cycle 9 Alternate Plugging Criteria 90-Day Report," Westinghouse Nuclear Services Division, January 1998.

4. SG-99-07-009, "Sequoyah Unit-2 Cycle 10 Voltage-Based Repair Criteria 90-Day Report," Westinghouse Nuclear Services Division, July 1999.

5. WCAP-14277, Revision 1, "SLB Leak Rate and Tube Burst Probability Analysis Methods for ODSCC at TSP Intersections," Westinghouse Nuclear Services Division, December 1996.

6. ABB CENP Report, 00-TR-FSW-006, Rev. 0, " GL 95-05 Analysis Methods for Sequoyah Unit 1", February 22, 2000.

8.0 References (Continued)

7. EPRI Report NP-7480-L, Addendum 2, 1998 Database Update , "Steam Generator Outside Diameter Stress Corrosion Cracking at Tube Support Plates – Database for Alternate Repair Criteria," April 1998

8. EPRI Report NP-7480-L, Addendum 3, 1999 Database Update , "Steam Generator Outside Diameter Stress Corrosion Cracking at Tube Support Plates – Database for Alternate Repair Criteria," May 1999

9. Westinghouse Report, 01-TR-FSW-003, Rev. 0, " Computation Details of GL 95-05 Analysis for Sequoyah Unit 2 EOC 10", January, 2001

Attachment 2
Sequoyah Unit 2 EOC-10 GL 95-05 Indications List

Steam Generator 1						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
2	12	H02	0.32	0.3		
2	93	C05	0.68	0.63		
3	16	H01	0.69	0.7		
3	16	H02	0.61	0.83		
3	20	H02	0.23	0.25		
3	34	H01	0.42	0.42		
3	46	H01	0.87	0.68		
3	46	H02	0.18	0.24		
3	47	H02	0.21	0.59		
4	11	H01	0.48	0.48		
5	7	H01	0.41	0.38		
5	11	H01	0.33	0.31		
5	13	H02	0.19	0.24		
5	26	H01	0.21	0.24	yes	no
5	26	H02	0.34	0.32		
5	43	H02	0.27	0.27		
5	46	H01	0.7	0.7		
6	4	H01	0.25	0.3		
6	35	H01	0.16	0.2		
8	3	H02	0.77	0.66		
9	25	H02	0.26	0.26		
9	30	H02	0.65	0.65	yes	no
9	34	H04	0.36	0.47		
9	39	H01	0.6	0.48		
10	18	C01	0.13	0.2		
10	47	H02	0.82	0.93		
10	77	H04	1.09	0.87		
11	61	H02	0.43	0.45		
12	46	H02	0.5	0.36		
13	62	H05	0.35	0.71		
14	11	H03	0.2	0.4		
15	31	H01	0.83	0.83	yes	yes
16	86	H04	0.61	0.76		
17	4	H01	0.8	0.82		
17	4	H03	0.9	0.52		
17	4	H04	0.35	0.3		
17	33	H02	0.95	0.69		
17	82	H05	0.25	0.24		
18	19	H02	1.12	1.05	yes	no

Steam Generator 1						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
19	37	H02	0.33	0.35	yes	No
19	66	H01	0.49	0.44		
19	74	H02	0.25	0.3		
19	77	H03	0.31	0.37		
20	58	H01	0.28	0.35		
20	58	H07	0.36	0.55		
20	65	H02	0.81	0.79		
20	78	H04	0.13	0.29		
21	7	H01	0.5	0.43		
21	8	H01	0.55	0.44		
21	78	H02	0.5	0.4		
22	31	H01	0.24	0.33		
22	33	H02	0.43	0.41		
22	46	H04	0.16	0.24		
22	48	H01	0.48	0.52		
23	20	H02	0.45	0.46		
23	23	H02	0.23	0.2		
23	25	H01	0.2	0.23		
24	21	H02	0.67	0.68		
24	33	H02	0.59	0.5		
25	8	H01	0.39	0.57		
25	25	H01	0.43	0.38		
25	37	H01	0.38	0.26		
27	13	H02	0.26	0.37		
27	25	H02	0.23	0.37		
27	48	H01	0.35	0.5		
27	48	H02	0.58	0.86		
27	52	H01	0.6	0.4		
28	26	H02	0.35	0.34		
28	28	H04	0.35	0.32		
28	28	H06	0.14	0.28		
28	31	H02	0.45	0.3		
28	43	H02	1.58	1.28		
28	45	H02	0.87	0.96		
28	46	H06	0.6	0.88	yes	no
28	77	H02	0.31	0.29		
29	52	H02	1.45	0.64	yes	no
30	41	H02	0.58	0.51		
30	82	H02	0.91	0.61		
32	31	H05	0.41	0.41		

32	42	H02	0.32	0.27		
Steam Generator 1						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
32	52	H02	0.58	0.85		
32	68	H01	0.47	0.47		
33	27	H04	0.8	0.26		
33	50	H02	1.03	0.74		
33	72	H02	0.39	0.3		
33	75	H05	0.47	0.3		
34	28	H01	0.24	0.38		
35	23	H01	0.54	0.54		
35	30	H01	0.42	0.53		
35	30	H02	0.27	0.35		
35	30	H03	0.13	0.31		
35	47	H02	0.31	0.28		
36	39	H02	0.85	0.97		
36	42	H02	0.21	0.57		
36	54	H02	0.44	0.28		
36	62	H02	0.37	0.59		
36	62	H03	0.35	0.31		
37	60	H05	0.23	0.29		
37	61	H02	0.77	0.76		
37	61	H03	0.28	0.24		
38	28	H03	0.18	0.13		
39	24	H04	0.35	0.36		
39	30	H05	0.3	0.21		
40	24	H01	0.49	0.81		
42	40	H02	0.44	0.48		
44	40	H02	0.32	0.45		
44	42	H02	0.54	0.59		
45	39	C01	0.55	0.47		
45	47	H04	0.41	0.59		

Steam Generator 2						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
1	76	H01	0.83	0.49	yes	no
2	22	H02	0.25	0.22		
2	55	H02	0.46	0.48		
2	58	H02	0.97	0.68		
2	73	H01	0.44	0.5		
2	73	H02	0.36	0.37		
2	76	H02	0.54	0.74		
2	77	H01	0.36	0.2		
2	83	H01	0.58	0.54		
2	84	H01	0.5	0.4		
2	85	H01	0.68	0.61		
2	85	H02	0.91	0.58		
2	87	H01	0.74	0.58	yes	yes
2	94	H02	0.71	0.67	yes	yes
3	37	H02	0.53	0.34	yes	no
3	42	H02	1.01	1.35		
3	49	H02	0.3	0.19		
3	72	H01	0.46	0.4		
3	76	H02	1.07	0.87	yes	yes
4	22	H02	0.25	0.23		
4	26	H02	0.68	0.69		
4	56	H02	0.92	0.83	yes	yes
4	92	H03	0.36	0.22	yes	yes
5	65	H02	0.51	0.24	yes	no
5	93	H01	0.8	0.25	yes	yes
6	5	H06	0.32	0.38	yes	no
6	40	H01	0.38	0.35		
6	41	H04	0.17	0.14		
6	43	H02	0.99	1.03		
6	48	H01	0.28	0.33		
6	70	H02	0.31	0.13	yes	no
7	4	H01	0.47	0.45		
7	4	H02	0.96	0.72		
8	13	H02	0.18	0.17		
8	42	H02	0.58	0.57		
8	44	H01	0.87	0.64		
8	47	H02	0.29	0.31		
8	51	H02	0.23	0.31		
8	61	H02	0.68	0.28		
8	64	H02	0.54	0.39	yes	no
8	70	H03	0.28	0.27	yes	yes

Steam Generator 2						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
8	90	H02	0.4	0.3		
8	92	H01	0.86	1.03		
9	57	H02	0.57	0.32		
9	72	H02	0.76	0.63		
10	31	H04	0.32	0.33		
10	39	H01	0.63	0.8		
11	65	H02	0.8	0.22		
11	67	H02	1.19	0.6	yes	no
11	75	H02	0.94	0.7	yes	no
12	44	H02	0.58	0.49		
13	21	H02	0.31	0.48		
14	48	H01	1.19	0.83		
14	48	H02	0.97	0.68		
14	84	H01	0.69	0.7		
14	90	H01	0.36	0.4		
15	33	H01	0.55	0.47		
15	54	H02	1.18	0.75		
15	89	H01	1.19	0.93		
16	33	H03	0.31	0.38		
20	49	H01	0.4	0.4		
20	56	H02	0.51	0.39		
20	58	H01	0.39	0.36		
21	53	H05	0.29	0.31		
22	34	H01	0.33	0.28		
23	17	H02	0.4	0.43		
23	22	H02	0.48	0.48		
23	44	H01	1.12	0.62		
23	49	H01	1.06	0.93		
23	55	H01	0.31	0.27		
23	73	H02	0.92	1.05	yes	no
23	86	H02	0.72	0.59	yes	no
24	37	H02	0.66	0.58		
24	87	H01	0.65	0.59		
25	72	H02	0.42	0.45		
26	59	H01	0.34	0.41		
27	24	H04	0.22	0.3		
27	53	H02	0.73	0.57		
27	84	H01	0.81	0.68		
28	17	H02	0.69	0.58		
28	66	H03	0.47	0.21		

28	69	H02	0.46	0.54		
Steam Generator 2						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
28	79	H02	0.4	0.28		
29	16	H01	0.46	0.56		
29	16	H02	0.6	0.53		
29	20	H02	0.59	0.52		
29	21	H02	0.35	0.29		
29	61	H04	0.21	0.33		
30	55	H01	0.91	0.97		
30	55	H05	0.34	0.46		
30	68	H02	1.36	1.24		
30	70	H01	0.32	0.27		
30	74	H02	1.69	1.32		
30	76	H02	1.15	0.69	yes	no
30	77	H02	0.33	0.33		
30	77	H03	0.55	0.53	yes	no
30	79	H02	0.6	0.22	yes	yes
30	81	H01	0.81	0.47		
30	81	H04	0.59	0.48		
30	82	H02	0.53	0.45		
31	38	H04	0.27	0.24		
31	70	H01	0.8	0.81		
32	20	H01	0.81	0.95		
32	20	H02	0.77	0.63		
33	50	H07	0.13	0.11		
33	53	H02	0.17	0.19		
33	75	C02	0.5	0.34		
35	45	H02	0.31	0.32		
35	55	H02	0.96	0.89		
36	42	H02	0.64	0.54		
36	64	H01	0.84	0.96		
36	71	H01	0.8	0.66		
36	74	H02	0.79	0.64		
37	20	H01	0.46	0.45		
38	45	H02	0.98	0.86		
38	45	H03	0.63	0.42		
39	55	H02	0.7	0.61		
39	58	H04	0.28	0.15		
40	60	H02	0.22	0.2		
41	50	H01	0.3	0.25		
41	54	H03	0.28	0.27		

41	55	H03	0.38	0.36		
42	43	H03	0.37	0.25		
Steam Generator 2						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
42	61	H01	0.38	0.31		
42	67	H06	1.86	0.87	yes	no
43	38	H02	0.56	0.44		
43	50	H02	0.18	0.2		
44	34	H03	0.4	0.45		
45	51	H02	0.41	0.49		

Steam Generator 3						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
1	82	C01	0.31	0.26	yes	no
2	16	H01	0.47	0.51		
2	29	H03	0.42	0.36		
2	31	H03	0.45	0.51		
2	38	H02	0.23	0.24		
2	39	H02	0.66	0.72		
3	2	H01	0.33	0.38		
3	5	H01	0.75	0.67		
3	10	H01	1.16	1.07		
3	34	H05	0.21	0.13	yes	no
3	51	H02	0.71	0.61		
4	55	H02	0.43	0.01		
5	1	H02	0.91	0.67		
5	4	H01	0.5	0.45		
5	19	H01	1.64	1.4		
5	22	H01	0.59	0.39		
5	56	H02	0.53	0.53	yes	no
6	10	H01	0.51	0.66		
6	33	H03	0.35	0.23		
6	38	H01	0.85	0.7	yes	yes
6	38	H03	0.67	0.55		
6	48	H01	0.84	0.84		
6	50	H01	0.27	0.33	yes	no
6	50	H02	0.54	0.61		
7	7	H01	0.48	0.91		
7	14	H01	0.64	0.74		
7	14	H02	0.21	0.82		
7	38	H01	0.46	0.41		
7	42	H04	0.24	0.31		
7	56	H02	0.61	0.53	yes	no
7	60	H01	0.74	0.68		
7	71	H02	0.99	0.9		
7	71	H03	0.72	0.48	yes	no
7	72	H01	0.41	0.44	yes	no
7	72	H02	0.8	1.11		
7	91	H02	0.33	0.17		
7	92	H03	0.61	0.51		
8	22	H03	0.27	0.39	yes	no
8	56	H01	1.93	1.69		
8	57	H04	0.3	0.29		
8	58	H01	1.5	1.1		

Steam Generator 3						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
8	63	H01	0.44	0.36		
8	64	H01	0.5	0.43		
8	69	H01	0.58	0.5		
9	11	H01	1.08	0.44		
9	41	H01	0.55	0.5		
9	48	H01	1.17	1.04		
9	48	H02	0.38	0.31		
9	50	H01	0.57	0.24		
9	51	H01	1.21	1.04	yes	yes
10	5	H01	0.63	0.84		
11	6	H01	0.44	0.41		
11	16	H06	0.18	0.14		
11	19	H02	0.83	0.73	yes	no
11	37	H01	0.83	0.72		
12	12	H01	0.51	0.71		
12	27	H01	0.38	0.36		
12	35	H02	0.61	1.03	yes	no
12	35	H03	0.58	0.85		
13	3	H01	0.29	0.35		
13	24	H02	0.65	0.54	yes	no
13	36	H01	0.81	0.66		
14	14	H01	0.74	0.37		
14	20	H02	0.55	0.56	yes	no
15	3	H01	0.86	0.94		
15	3	H02	0.73	0.5		
15	15	H01	0.99	0.5		
15	30	H01	0.71	0.6	yes	no
16	4	H01	0.97	0.73		
16	4	H02	0.39	0.47		
16	5	H04	0.23	0.13		
16	40	H01	0.76	0.54	yes	no
16	41	H01	0.75	0.68		
16	54	H01	0.83	0.8		
17	47	H01	0.7	0.34		
18	18	H01	0.67	0.79		
18	35	H01	1.04	1.07		
18	38	H01	0.95	0.67		
18	49	H01	1.28	1.1		
19	13	H01	0.32	0.57		
20	12	H01	0.52	0.7		

20	28	H01	1.18	1.07		
Steam Generator 3						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
20	29	H01	0.95	0.76		
20	30	H01	0.9	0.84		
20	31	H01	0.63	0.43		
20	32	H01	1.03	1.09		
20	39	H01	0.79	0.58		
20	80	H03	0.49	0.84		
20	86	H01	0.53	0.96	yes	no
21	24	H01	1.06	1.18		
21	81	H02	0.78	0.67		
21	84	H04	0.51	0.43		
22	52	H01	0.62	0.42		
23	44	H01	0.33	0.39		
24	12	H01	0.81	0.53		
24	16	H01	1.2	0.98		
24	25	H01	0.27	0.28		
24	29	H01	0.91	0.95		
25	18	H01	1.01	0.73		
25	24	H01	0.57	0.29		
25	49	H01	0.41	0.32		
26	9	H01	0.56	0.6		
26	22	H04	0.46	0.35	yes	no
26	23	H01	1.15	0.95		
26	35	H01	0.98	0.75		
27	26	H02	1.1	1.36		
27	30	H02	0.63	0.86		
27	35	H01	0.47	0.75		
27	60	H02	0.71	0.44	yes	no
27	67	H02	0.39	0.23		
27	68	H02	0.51	0.23		
28	84	H01	0.35	0.26	yes	yes
30	23	H01	1.27	1.07		
30	42	H02	0.36	0.35		
30	50	H01	0.94	0.47		
30	83	C02	0.29	0.19		
32	20	H01	0.34	0.42		
32	23	H01	1.91	1.2	yes	yes
32	42	H02	0.49	0.48		
33	25	H04	0.73	0.75		
33	27	H01	0.76	0.75		

33	49	H03	0.64	0.48		
33	67	H04	0.27	0.15		
Steam Generator 3						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
34	19	H02	0.46	0.26		
34	32	H01	1.89	1.75		
34	51	H02	0.64	0.58		
34	72	H02	0.73	0.67		
35	21	H01	0.59	0.38		
35	47	H03	0.46	0.43		
36	40	H04	0.4	0.43		
38	22	H01	0.95	0.8		
38	42	H03	1.27	0.59		
38	58	H02	1.29	0.89		
39	68	H04	0.33	0.28		
40	24	H02	0.6	0.49		
40	69	H02	0.32	0.54		
41	32	C02	0.5	0.32		
41	36	H04	0.58	0.5		
42	33	H01	0.19	0.28		
43	44	H04	0.37	0.45		
43	59	H01	0.57	0.45		
44	33	H01	1.74	1.29	yes	yes
46	52	H03	0.6	0.35	yes	no

Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
2	9	H03	0.51	0.37		
2	15	H02	0.24	0.24		
2	15	H03	0.43	0.36		
2	25	H01	0.62	0.52		
2	37	H01	0.31	0.26		
2	37	H02	0.66	0.72		
2	38	H02	0.34	0.22		
2	40	H01	1.23	1.02		
2	53	H01	0.55	0.54		
2	55	H01	1.01	0.99		
2	61	H01	0.61	0.69		
2	61	H02	0.54	0.53		
2	67	H01	0.9	0.94		
2	72	H02	0.36	0.29		
2	73	H01	0.8	0.31		
2	75	H01	0.34	0.25		
2	76	H01	0.95	0.96		
2	77	C07	0.29	0.18		
2	79	C05	0.29	0.3		
2	86	H02	0.61	0.62		
3	16	H04	0.36	0.43		
3	18	H02	0.61	0.41		
3	25	C04	0.28	0.27		
3	25	H01	0.58	0.59		
3	25	H02	0.54	0.55		
3	25	H03	0.38	0.19		
3	28	H03	0.69	0.5	yes	no
3	43	H01	0.63	0.26		
3	71	H01	1.17	1.05		
3	72	H01	1.07	0.82		
4	8	H06	0.33	0.37		
4	12	H02	0.32	0.28		
4	14	H06	0.42	0.36		
4	16	H06	0.22	0.23		
4	19	H02	0.42	0.36		
4	22	H02	0.32	0.35		
4	23	H01	0.48	0.36		
4	25	H01	0.36	0.29		
4	27	H01	0.38	0.46		
4	40	H01	0.57	0.48		

Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
4	43	H01	0.42	0.42		
4	47	H02	0.53	0.46	yes	no
4	48	H05	0.29	0.24		
4	74	H03	0.6	0.59		
4	77	H01	0.41	0.39		
4	78	H01	0.47	0.49		
4	78	H02	0.21	0.26		
4	83	H01	0.44	0.37		
4	86	H03	0.62	0.57		
4	87	H01	0.68	0.73		
4	87	H03	0.63	0.6		
4	89	H03	0.77	0.57		
4	90	H01	1	0.6		
4	90	H02	0.57	0.58		
4	91	H01	0.45	0.46	yes	yes
4	91	H02	0.32	0.11	yes	no
4	92	H03	0.91	0.72		
4	94	H01	0.95	0.53	yes	yes
5	1	H01	0.34	0.3		
5	6	H02	0.22	0.23		
5	26	H01	0.37	0.44	yes	yes
5	30	H01	0.86	0.54	yes	yes
5	33	H01	0.73	0.64		
5	34	H01	0.73	0.44		
5	35	H01	0.56	0.26		
5	39	H01	0.98	0.88		
5	42	H01	1.03	0.79		
5	44	H01	0.53	0.55		
5	46	H01	0.35	0.26		
5	53	H01	0.39	0.43		
5	71	H01	0.69	0.49	yes	yes
5	74	H01	0.57	0.6		
5	79	H01	0.56	0.51		
5	80	H01	1.06	0.81		
5	82	H01	0.77	0.57		
5	83	H01	0.83	0.64		
5	89	H01	0.79	0.8		
5	91	H01	0.78	0.45		
5	92	H01	0.78	0.6		
5	93	H01	0.89	0.7		

6	2	C01	0.25	0.3		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
6	23	H02	0.6	0.62	yes	yes
6	25	H02	0.4	0.46		
6	28	H01	0.39	0.67	yes	yes
6	32	H02	0.38	0.44		
6	34	H01	0.76	0.21		
6	34	H02	0.44	0.33		
6	36	H01	0.91	0.78		
6	37	H01	0.51	0.47		
6	43	H01	0.68	0.41		
6	43	H02	0.25	0.22		
6	45	H01	0.21	0.22		
6	46	H01	0.58	0.59		
6	52	H05	0.14	0.22		
6	66	H01	0.52	0.49		
6	72	H01	0.51	0.43		
6	74	H01	0.71	0.55	yes	yes
6	75	H01	0.55	0.53		
6	76	H01	0.24	0.2	yes	yes
6	80	H01	0.5	0.35	yes	yes
6	84	H01	0.5	0.37		
6	87	H02	0.67	0.37	yes	yes
6	88	H01	0.65	0.39	yes	yes
6	89	H03	0.71	0.83		
6	90	H01	0.79	0.61	yes	yes
6	90	H02	0.46	0.38		
6	91	H01	0.76	0.68		
6	92	H01	0.47	0.25		
7	18	H02	0.44	0.55		
7	48	H01	1.58	1.19		
7	51	H01	0.86	0.8		
7	59	H01	0.68	0.59	yes	yes
7	64	H01	0.43	0.38		
8	3	H03	0.46	0.58		
8	3	H04	0.19	0.26		
8	8	H02	0.26	0.47		
8	12	H01	0.3	0.28		
8	17	H02	0.79	0.99		
8	25	H01	0.45	0.56		
8	27	H01	0.55	0.58		

8	27	H03	0.49	0.64		
8	28	H01	0.48	0.59	yes	yes
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
8	29	H01	0.23	0.23		
8	30	H01	0.59	0.63		
8	31	H01	0.72	0.5		
8	32	H01	0.76	0.75		
8	33	H01	0.43	0.48		
8	34	H01	1.42	1.28		
8	35	H01	0.5	0.38		
8	36	H01	0.77	0.6		
8	37	H01	1.37	1.4		
8	38	H01	0.53	0.53		
8	39	H01	0.41	0.4		
8	40	H01	0.46	0.44		
8	41	H01	0.66	0.45		
8	42	H01	0.52	0.61		
8	44	H02	0.14	0.23		
8	45	H01	0.33	0.34		
8	52	H01	0.97	1.13		
8	53	H01	0.73	0.72		
8	55	H01	0.53	0.57		
8	59	H01	0.35	0.35		
8	60	H01	1	0.75		
8	67	H03	0.43	0.27	yes	no
8	71	H01	0.61	0.59		
8	73	H03	0.63	0.53		
8	78	H03	0.32	0.36		
8	80	H01	0.64	0.54	yes	yes
8	80	H02	0.63	0.52		
8	82	H01	0.37	0.42		
8	83	H01	0.93	0.91		
8	85	H01	0.69	0.66		
8	85	H02	0.86	0.63		
8	86	H01	0.41	0.3	yes	yes
8	89	H01	0.91	0.74		
8	91	H03	0.66	0.66	yes	no
8	92	H01	1.32	1.28		
8	92	H02	0.96	0.78		
9	18	H02	0.42	0.33		
9	22	H02	0.69	0.63		

9	23	H01	0.46	0.4		
9	24	H01	0.72	0.69		
9	25	H01	0.3	0.26		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
9	30	H01	0.5	0.42		
9	31	H01	0.24	0.31		
9	33	H01	0.51	0.56		
9	37	H01	0.6	0.48		
9	38	H01	1.12	1.06		
9	39	H01	0.35	0.6		
9	40	H02	0.28	0.24		
9	42	H01	0.96	0.84		
9	44	H01	0.66	0.56		
9	46	H01	0.58	0.4		
9	47	H01	0.35	0.43		
9	48	H01	0.7	0.61		
9	53	H01	0.55	0.56		
9	70	H01	0.4	0.41		
9	74	H04	0.34	0.42		
10	3	H02	0.34	0.36		
10	35	H01	0.51	0.53		
11	68	H07	0.41	0.34		
11	69	H03	0.1	0.16		
12	21	H01	0.72	0.51		
12	21	H02	0.61	0.68		
12	23	H01	0.62	0.62		
12	24	H01	0.89	0.89		
12	24	H02	0.54	0.25		
12	26	H01	0.22	0.29		
12	26	H02	0.27	0.51		
12	27	H01	0.3	0.37		
12	31	H03	0.41	0.37		
12	32	H01	0.62	0.63		
12	35	H01	0.39	0.36		
12	36	H01	0.65	0.64		
12	38	H01	0.33	0.28		
12	39	H01	0.4	0.52		
12	40	H01	0.4	0.37		
12	41	H01	0.6	0.66		
12	43	H01	0.6	1.14		
12	44	H01	0.99	0.8		

12	45	H01	1.73	1.45		
12	45	H03	0.45	0.42		
12	59	H01	0.42	0.56		
12	61	H01	0.69	0.58		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
12	63	H01	0.55	0.65		
12	65	H02	0.21	0.24		
12	71	H01	0.7	0.53		
12	72	H01	1.53	1.63		
12	74	H01	0.54	0.62		
12	76	H01	0.87	1.02		
12	83	H01	0.83	0.87		
13	29	H02	0.43	0.57		
13	32	H02	0.31	0.19		
13	33	H01	0.4	0.62		
13	34	H01	0.77	0.64		
13	35	H02	0.56	0.64		
13	38	H01	0.93	1.01		
13	39	H02	0.2	0.37		
13	41	H03	0.37	0.42		
13	42	H01	0.76	0.79		
13	43	H03	0.25	0.31		
13	45	H01	0.82	0.77		
13	46	H01	0.57	0.55		
13	47	H01	0.57	0.79		
13	47	H03	0.32	0.35		
13	48	H01	1.03	0.88		
13	52	H01	0.49	0.47		
13	53	H01	0.94	0.96		
13	54	H01	0.59	0.51		
13	68	H02	0.26	0.16		
13	77	H01	0.56	0.54		
13	84	H02	0.47	0.56		
14	57	H01	0.9	0.63		
14	59	H01	0.43	0.45		
14	83	H01	0.28	0.32		
14	88	H01	0.65	0.85		
14	92	H01	0.97	1.1		
15	48	H01	0.84	0.96		
15	49	H01	0.33	0.67		
15	50	H01	0.71	0.64		

15	50	H02	0.47	0.53		
15	51	H01	0.74	0.77		
15	52	H01	0.84	0.72		
15	53	H01	0.82	0.73		
15	62	H01	0.57	0.49		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
15	65	H01	0.39	0.38		
15	66	H01	0.23	0.73		
15	67	H01	0.47	0.65		
16	35	H01	0.42	0.35		
16	45	H01	0.28	0.44		
17	13	H02	0.51	0.64		
17	20	H01	0.68	0.81		
17	21	H04	0.26	0.33		
17	27	H01	0.44	0.46		
17	29	H01	0.15	0.15		
17	31	H04	0.51	0.66		
17	55	H01	0.56	0.75		
17	56	H01	0.71	0.78		
17	56	H02	0.38	0.43		
17	57	H01	0.45	0.56		
17	62	H01	0.27	0.31		
17	82	H01	0.6	0.49		
17	87	H01	1.48	1.42		
18	11	H04	0.21	0.24		
18	21	H01	0.23	0.44		
18	21	H02	0.26	0.6		
18	32	H03	0.41	0.21		
18	33	H05	0.64	0.38		
18	36	H03	0.24	0.09		
18	38	H03	0.39	0.29		
18	40	H05	0.25	0.29		
18	51	H05	0.35	0.3		
18	58	H01	0.6	0.53		
18	61	H01	0.4	0.52		
18	62	H01	0.81	0.55	yes	no
18	64	H01	0.27	0.25		
18	67	H01	0.41	0.43		
19	7	C01	0.6	0.35		
19	26	H01	0.18	0.13		
19	35	H01	0.38	0.22		

19	43	H02	0.33	0.29		
19	51	H01	0.43	0.54		
19	53	H04	0.3	0.26		
19	63	H01	0.44	0.55		
19	71	H01	0.42	0.43		
19	77	H01	0.75	0.68	yes	no
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
19	87	H03	0.18	0.13		
20	20	H04	0.22	0.25		
20	25	H01	0.26	0.18		
20	26	H02	0.55	0.85		
20	33	H01	0.59	0.63		
20	33	H05	0.37	0.28		
20	34	H02	0.53	0.78		
20	39	H01	0.38	0.25		
20	39	H03	0.25	0.34		
20	40	H01	0.17	0.25		
20	42	H01	0.31	0.38		
20	44	H02	0.41	0.58		
20	44	H03	0.29	0.29		
20	45	H01	0.35	0.42		
20	46	H01	0.54	0.57		
20	46	H02	0.83	0.54		
20	46	H03	0.42	0.63		
20	46	H06	0.34	0.44		
20	47	H01	0.42	0.36		
20	47	H02	0.36	0.52		
20	48	H01	1.08	0.94		
20	49	H01	0.28	0.25		
20	50	H01	0.81	0.81		
20	51	H01	0.66	0.48		
20	52	H01	0.55	0.66		
20	54	H01	0.7	0.92		
20	56	H01	0.56	0.53		
20	58	H01	0.51	0.62		
20	59	H01	0.53	0.67		
20	60	H01	0.85	0.76		
20	61	H01	0.47	0.57		
20	62	H01	0.38	0.4		
20	63	H01	0.6	0.62		
20	64	H01	0.28	0.44		

20	64	H02	0.41	0.44		
20	65	H01	0.33	0.34		
20	68	H01	0.29	0.42		
20	69	H01	1.17	1.27		
20	70	H02	0.61	0.63		
21	15	H06	0.33	0.37		
21	19	C05	0.57	0.54		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
21	44	H01	0.15	0.25		
21	48	H01	0.18	0.46		
22	17	C04	0.31	0.55		
22	17	C05	0.42	0.43		
22	17	C07	0.44	0.49		
22	25	H02	0.47	0.76		
22	25	H03	0.55	0.72		
22	33	H02	0.88	1.23		
22	35	C04	0.3	0.32		
22	41	H01	0.6	0.43		
22	46	H01	0.4	0.2		
22	46	H02	0.57	0.55		
22	46	H03	0.37	0.28		
22	47	H02	1.21	1.34		
22	59	H01	0.7	0.87		
23	61	H02	0.57	0.43		
23	63	H01	1.01	0.93		
23	64	H01	0.65	0.73		
23	65	H02	0.33	0.28		
23	66	H01	0.5	0.53		
23	66	H02	0.45	1.02		
23	67	H02	0.33	0.39		
23	68	H01	0.55	0.48		
23	69	H01	0.44	0.55		
23	69	H02	0.52	0.45		
23	70	H01	0.92	0.58		
23	71	H01	0.52	0.6		
23	72	H01	0.62	0.73		
23	73	H02	0.82	1.03		
23	73	H06	0.25	0.27		
23	74	H01	0.52	0.45		
23	75	H01	0.59	0.64		
23	86	H03	0.25	0.23		

23	87	H01	0.72	0.74		
24	46	H01	0.49	0.38		
24	52	H02	0.56	0.39		
25	40	H01	0.84	0.8		
25	41	H01	0.51	0.79	yes	no
25	42	C06	0.15	0.25		
25	42	H01	0.39	0.62		
25	43	H01	0.29	0.47		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
25	47	H05	0.13	0.23		
25	50	H01	0.16	0.37		
25	53	H01	0.76	0.91		
25	53	H02	0.24	0.77		
25	58	H01	0.41	0.48		
25	60	H02	0.27	0.25		
25	67	H04	0.36	0.4		
25	80	H02	0.28	0.29		
25	83	H01	0.62	0.71		
26	19	H02	0.58	0.79		
26	20	H02	0.36	0.4		
26	27	H03	0.31	0.36		
26	27	H06	0.23	0.27		
26	31	H06	0.32	0.18		
26	33	H02	0.25	0.36		
26	35	H01	0.53	0.57		
26	62	H01	0.34	0.36		
26	64	H01	0.41	0.34		
26	68	H01	1.16	1.49		
26	69	H01	0.53	0.71		
26	71	H01	0.25	0.39		
26	73	H02	0.55	0.48		
26	85	H01	0.35	0.39		
27	11	C01	0.45	0.32		
27	15	H02	0.45	0.86		
27	22	H04	0.13	0.27		
27	45	H01	0.59	0.56		
27	62	H01	0.5	0.62		
27	63	H01	0.59	0.64		
27	63	H02	0.41	0.38		
27	65	H02	0.56	0.54		
27	65	H03	0.23	0.3		

27	66	H02	0.22	0.43		
27	66	H04	0.21	0.12		
27	67	H02	0.41	0.43		
27	69	H01	0.63	0.51		
27	70	H01	1.14	1.35		
27	70	H03	0.43	0.43	yes	no
27	71	H01	0.99	1.25		
27	72	H02	0.57	0.68		
27	72	H03	0.46	0.54		

Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
27	73	H02	0.92	0.66		
27	74	H01	0.59	0.53		
27	74	H02	0.54	0.52		
27	75	H01	0.85	0.91		
27	75	H02	0.76	0.79		
27	77	H01	0.62	0.66		
27	77	H02	0.61	0.58		
27	77	H03	0.81	0.71		
27	78	H01	0.65	0.75		
27	78	H02	0.86	1.03		
27	79	H02	0.69	0.68		
27	80	H02	0.41	0.58		
27	81	H03	0.53	0.62		
27	82	H03	0.89	0.93		
27	83	H02	0.41	0.49	yes	no
27	83	H04	0.2	0.26		
27	84	H02	0.55	0.62		
28	20	H01	0.32	0.53		
28	28	H04	0.25	0.11		
28	29	H06	0.18	0.25		
28	34	H01	0.19	0.23		
28	35	H02	0.26	0.35		
28	40	H02	0.39	0.42		
28	45	H01	0.53	0.5		
28	48	H01	0.64	0.54		
28	62	H02	0.25	0.5		
28	64	H02	0.39	0.27		
28	65	H01	0.62	0.69		
28	66	H03	0.39	0.48		
28	67	H01	1.17	1.16		
28	68	H01	0.62	0.45		

28	68	H02	0.24	0.14		
28	70	H01	0.35	0.55		
28	70	H02	0.81	0.53		
28	71	H01	0.75	0.58		
28	72	H01	0.77	0.84		
28	72	H02	0.77	0.83		
28	72	H03	0.59	0.56		
28	74	H03	0.87	1.01		
28	74	H05	0.46	0.4		
28	75	H01	0.83	0.46		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
28	75	H02	0.74	0.68		
28	77	H01	0.47	0.51	yes	yes
28	78	H01	0.66	0.59		
28	79	H03	0.45	0.6		
28	80	H03	0.45	0.57		
28	81	H02	0.44	0.68		
28	81	H03	0.64	0.63		
28	82	H02	0.67	0.86		
29	14	H01	0.29	0.27		
29	18	H07	0.55	0.97		
29	19	H06	0.63	0.62		
29	27	H02	0.34	0.39	yes	yes
29	27	H07	0.14	0.22		
29	38	H01	0.34	0.43		
29	43	H01	0.28	0.55		
29	47	H01	0.44	0.85		
29	48	H01	0.65	0.73		
29	51	H01	0.41	0.63		
29	59	H06	0.31	0.3		
30	21	H02	0.34	0.66		
30	28	H04	0.22	0.14		
30	54	H01	0.27	0.44		
30	77	H01	0.91	0.85	yes	no
31	39	H01	0.32	0.36		
31	40	H02	0.51	0.39		
31	54	H01	0.29	0.45		
31	55	H02	0.44	0.72		
31	71	H01	0.58	0.7		
31	71	H02	0.64	1.02		
31	71	H03	0.53	0.47		

31	72	H01	0.58	0.6		
32	23	H02	0.06	0.22		
32	62	H02	0.58	0.42		
32	64	H01	0.47	0.64		
32	64	H02	0.61	0.88		
32	65	H01	0.36	0.25		
32	65	H02	0.3	0.46		
32	67	H02	0.6	0.53		
32	67	H03	0.45	0.28		
32	68	H02	0.4	0.85	yes	yes
32	69	H01	0.73	1.03		

Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
32	70	H02	0.73	0.63		
32	71	H01	0.44	0.39		
32	74	H01	0.4	0.51		
33	51	H02	0.41	0.62		
34	25	H02	0.49	0.59		
34	30	H02	0.52	0.6		
34	47	H01	0.46	0.21		
34	50	H03	0.38	0.21		
34	58	H02	0.39	0.47		
34	65	H01	0.56	0.22		
34	65	H02	0.52	0.55		
34	71	H02	0.51	0.55		
34	72	H01	0.71	0.32		
35	33	H03	0.21	0.21		
35	46	H06	0.36	0.29		
35	62	H02	0.26	0.3		
36	25	H02	0.33	0.45		
36	47	H01	0.27	0.16		
36	53	H03	0.2	0.15		
36	54	H04	0.21	0.29		
36	56	H02	0.35	0.65		
36	57	H02	0.38	0.46		
36	62	H02	0.69	0.9		
36	64	H02	0.58	0.59		
36	65	H01	0.57	0.56		
36	68	H02	0.31	0.47		
36	72	H01	0.31	0.4		
37	62	H04	0.19	0.27		
37	63	H01	0.51	0.69		

37	72	H01	0.42	0.51		
38	24	H03	0.31	0.38		
38	25	H02	0.57	0.34	yes	no
38	26	H02	0.41	0.53		
38	30	H02	0.52	0.59		
38	34	H02	0.42	0.42		
38	61	H02	0.55	0.59	yes	yes
38	72	H02	0.52	0.51		
39	37	H03	0.3	0.39		
39	42	H03	0.24	0.52		
39	42	H04	0.26	0.19		
39	45	H03	0.12	0.28		
Steam Generator 4						
ROW	COL	SUPPORT	EOC 10 VOLTS	EOC 9 VOLTS	RPC Tested?	Confirmed ?
39	49	H02	0.43	0.41		
39	66	H01	0.25	0.46		
39	70	H03	0.64	0.47		
40	57	H01	0.26	0.38		
41	65	C02	0.23	0.14		
41	67	C01	0.33	0.18		
42	38	H02	0.44	0.49		
45	41	C02	0.25	0.19		
45	51	H04	0.28	0.47		
45	58	H03	0.49	0.62		
46	53	C02	0.48	0.33		