Westinghouse Non-Proprietary Class 3

SG-SGDA-05-51
Revision 0

January 2006

# Comanche Peak Unit 1

# Cycle 12 Voltage-Based Repair Criteria 90-Day Report

Prepared for TXU Power

Westinghouse

This page intentionally left blank

**SG-SGDA-05-51**
**Revision 0**

TXU Power

# Comanche Peak Unit 1

# Cycle 12 Voltage-Based Repair Criteria 90-Day Report


| Author's Name | Signature / Date |
|---|---|
| Thomas P. Magee | *Official Record Electronically Approved in EDMS* |

| Verifier's Name | Signature / Date |
|---|---|
| David J. Ayres | *Official Record Electronically Approved in EDMS* |

| Manager Name | Signature / Date |
|---|---|
| Earl P. Morgan | *Official Record Electronically Approved in EDMS* |


This report has been prepared by Westinghouse Electric Company LLC and bears a Westinghouse Electric Company copyright notice. You are permitted to copy and redistribute all or portions of the report; however all copies made by you must include the copyright notice in all instances.

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

© 2006 Westinghouse Electric Company LLC
All Rights Reserved

This page intentionally left blank

# TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## GLOSSARY OF ACRONYMS

BOC - Beginning of operation cycle. The most recent inspection was just prior to BOC-12.

DSI – Distorted Support Indication. An indication found by bobbin probe that indicates the possible presence of ODSCC.

DSS – Distorted Support Signal. A signal within a support that was determined by MRPC to be unlike ODSCC.

EFPD – Effective Full Power Days

EFPY - Effective Full Power Years

EOC - End of operation cycle. The most recent inspection was at EOC-11. The end of the next cycle is EOC-12.

MRPC – Motorized rotating pancake coil. Also refers to the Plus-Point coil.

NODP – Normal operating differential pressure.

ODSCC - Outside diameter stress corrosion cracking.

POD - Probability of detection. This value is set equal to 0.60 for the GL-95-05 predictive analysis for the condition of the steam generators at the end of the next cycle.

SAI – Single Axial Indication. An indication found by MRPC that indicates the likely presence of ODSCC.

SG - Steam generator identifier. Specifically SG 1, SG 2, SG 3 and SG 4.

TSP - Tube support plate. The generic letter 95-05 alternate repair criterion applies to ODSCC in the tubes at the TSPs.

# 1.0 INTRODUCTION

Comanche Peak Unit 1 completed its Cycle 11 of operation and subsequent steam generator tube inspection in October 2005. Axial ODSCC has been confirmed within the TSP regions of the steam generators and is a current degradation mechanism at Comanche Peak Unit 1. The alternate repair criterion (ARC) defined in NRC Generic Letter 95-05 (Reference 1) is implemented at Comanche Peak Unit 1. This report provides a condition monitoring assessment that demonstrates that the GL-95-05 acceptance criteria were satisfied at the end of operating Cycle 11 (EOC-11), and an operational assessment that demonstrates that the GL-95-05 acceptance criteria will continue to be satisfied throughout operating Cycle 12. A Comanche Peak-1 specific voltage growth rate was used in the EOC-12 prediction.

The operating cycle just completed, Cycle 11, was 517.35 Effective Full Power Days (EFPD) in length. The next cycle, Cycle 12 is estimated to be 480 EFPD (Reference 2).

## 2.0 SUMMARY AND CONCLUSIONS

Bobbin voltage indications of ODSCC at the tube support plates were detected and measured in all four steam generators. Based on this voltage distribution, using the methodology of References 1 and 3, 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-11 was performed. The acceptance criteria on POB and leakage are satisfied with significant margin.

The change in voltage from the previous inspection was determined by historical review for each indication detected. The apparent voltage growth rate during Cycle 11 was based on the historic review of 357 DSI indications identified during the Comanche Peak Unit 1 EOC-11 inspection. An operational assessment prediction of the POB and leakage at steam line break conditions at EOC-12 was performed using a site specific bounding growth rate. The results indicate that the acceptance criteria on POB and leakage at EOC-12 will be satisfied with significant margin. Therefore the Reference 1 acceptance criteria will be satisfied throughout Cycle 12.

# 3.0 EOC-11 INSPECTION RESULTS

## 3.1 VOLTAGE DISTRIBUTIONS AT EOC-11

According to the guidance provided by the NRC Generic Letter 95-05, the EOC 11 inspection of the Comanche Peak Unit-1 SGs consisted of a 100% eddy current (EC) bobbin probe full length examination (the + Point probe was used in lieu of the bobbin probe for low row number U-bend regions) of the tube bundles in all four SGs. A 0.610 inch diameter probe was used for hot and cold leg TSPs where a voltage-based repair criterion was applied. The largest indication found among the 4 SGs had 1.26 volts amplitude and was found in SG 2. It was inspected with an MRPC probe and confirmed to have a single axial indication; the tube containing that indication was plugged. Four TSP ODSCC indications were detected on the cold leg side but all of these were tested with MRPC and were not confirmed.

Appendix A contains a listing of all DSI indications and their repair status. All DSI indications with an EOC-11 voltage greater than or equal to 1 volt were subject to + Point inspection, in accordance with Reference 1 requirements for 3/4-inch diameter tubing. Indications confirmed as being crack-like by the + Point inspection were plugged.

No circumferential ODSCC was reported at tube support plates. Also, no ODSCC indications extending outside the TSP edges were found. Bobbin mixed residual signals with voltages large enough to potentially mask a 1.0-volt bobbin indication (residual signal voltage 1.5 volts or greater) were detected at 1 TSP intersection in each of SG 1, SG 2 and SG 3, and no TSP intersections in SG-4. All of these intersections were inspected with an MRPC probe. Only one of these TSP regions with significant mixed residual signals, the 1.26 volt DSI in SG 2 noted above, was found to have ODSCC; it was subsequently plugged. No signal interference was found from copper deposits. All dents over 5 volts within TSPs identified in the present inspection were also MRPC inspected, and no degradation was detected.

Summaries of eddy current signal voltage distributions at the drilled support plates, for each steam generator, are shown in Table 3-1 through Table 3-5. Also shown are the number of indications in each voltage range detected at EOC-11 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 12 is the difference between the number of indications detected and the number of indications removed from service. No tubes were unplugged with the intent to return them to service after inspection.

Figure 3-1 through Figure 3-6 illustrates the voltage distribution in each steam generator. Figure 3-1 provides a comparison of the voltage distributions in each of the steam generators. As was the case with the EOC-10 inspection, the majority of TSP ODSCC indications were found in SG 4.

Figure 3-2 and Figure 3-3 shows the detected voltage distribution compared to the predicted distribution which was developed in the previous 90-day report, Reference 5. In the previous 90-day report, the calculations for the EOC-11 bobbin voltage projections were performed for SG-4 and for all four SGs combined using the measured EOC-10 voltage data. Steam generators 1, 2, and

3 were not analyzed separately since there were so few indications in these generators. Figure 3-4 shows the distribution of repaired indications, and Figure 3-5 and Figure 3-6 show the distribution of indications that will remain in service for the next operating cycle.

The summary of all four-steam generators shows the following:

- A total of 362 TSP regions were identified as having ODSCC bobbin or MRPC signal indications during the inspection. Eight of these TSP regions were reinspected with MRPC. Four of these reinspected regions were not confirmed by MRPC and were subsequently reclassified as a DSS indication, leaving 357 DSI indications and one other TSP region identified as having ODSCC by MRPC (but without a bobbin DSI).
- As noted in Reference 4, Comanche Peak-1 has intersections that are excluded from the voltage-based repair criteria (Section 1.b.1 of Reference 1). None of these 362 indications were in these excluded regions. None of these 362 indications were associated with a dent signal greater than 5 volts, or copper deposits. Only three intersections had mixed residual signals greater than 1.5 volts (which might cause a 1.0 volt ODSCC indication to be missed or misread); all three were tested with MRPC and only one, which had a detectable indication by bobbin, was confirmed (and subsequently plugged).
- Of the 362 TSP regions, 1 had a DSI indication that was equal to or greater than 1 volt.
- All indication with voltages greater than or equal to 1 volt, were subject to an inspection with a + Point probe. Indications that were greater than or equal to 1 volt that were confirmed during the + Point inspection were removed from service by plugging.
- The one TSP region that had an indication above 1 volt was repaired by plugging. It was plugged because of MRPC-confirmed ODSCC at that particular support plate.
- Two of the 362 TSP regions were removed from service for reasons other than MRPC-confirmed ODSCC at their specific support plate.

Table 3-1: Inspection Results for SG 1 EOC-11

| Voltage Bin | Number of Indications (see note) | MRPC Confirmed | MRPC Tested But Not Confirmed | Not MRPC Tested | Plugged | Returned to Service | In-Service MRPC Confirmed or not Tested |
|---|---|---|---|---|---|---|---|
| 0.1 | 1 | | | 1 | | 1 | 1 |
| 0.2 | 11 | | | 11 | | 11 | 11 |
| 0.3 | 18 | | | 18 | | 18 | 18 |
| 0.4 | 1 | | 1 | | 1 | | |
| 0.5 | 2 | | | 2 | | 2 | 2 |
| Total | 33 | 0 | 1 | 32 | 1 | 32 | 32 |

Average voltage = 0.233 volts

Note: The 'Number of Indications' column includes both DSI and DSS indications. DSI indications that were tested, but not confirmed, by MRPC were converted to a DSS designation. The average voltage is for the combined set of DSI and DSS indications.

Table 3-2: Inspection Results for SG 2 EOC-11

| Voltage Bin | Number of Indications (see note) | MRPC Confirmed | MRPC Tested But Not Confirmed | Not MRPC Tested | Plugged | Returned to Service | In-Service MRPC Confirmed or not Tested |
|---|---|---|---|---|---|---|---|
| 0.2 | 5 | | | 5 | | 5 | 5 |
| 0.3 | 7 | | | 7 | | 7 | 7 |
| 0.4 | 4 | | 1 | 3 | | 4 | 3 |
| 0.5 | 7 | | | 7 | | 7 | 7 |
| 0.6 | 2 | | | 2 | | 2 | 2 |
| 0.7 | 3 | 1 | | 2 | | 3 | 3 |
| 0.8 | 2 | | | 2 | | 2 | 2 |
| 0.88 | 1 | | | 1 | 1 | | |
| 0.95 | 1 | | | 1 | | 1 | 1 |
| 1.26 | 1 | 1 | | | 1 | | |
| Total | 33 | 2 | 1 | 30 | 2 | 31 | 31 |

Average voltage = 0.453 volts

Note: The 'Number of Indications' column includes both DSI and DSS indications. DSI indications that were tested, but not confirmed, by MRPC were converted to a DSS designation. The average voltage is for the combined set of DSI and DSS indications.

Table 3-3: Inspection Results for SG 3 EOC-11

| Voltage Bin | Number of Indications (see note) | MRPC Confirmed | MRPC Tested But Not Confirmed | Not MRPC Tested | Plugged | Returned to Service | In-Service MRPC Confirmed or not Tested |
|---|---|---|---|---|---|---|---|
| 0.2 | 3 | | | 3 | | 3 | 3 |
| 0.3 | 9 | | | 9 | | 9 | 9 |
| 0.4 | 6 | | | 6 | | 6 | 6 |
| 0.5 | 7 | | 1 | 6 | | 7 | 6 |
| 0.6 | 6 | 1 | | 5 | | 6 | 6 |
| 0.7 | 2 | | | 2 | | 2 | 2 |
| 0.81 | 1 | | | 1 | | 1 | 1 |
| 0.94 | 1 | | | 1 | | 1 | 1 |
| Total | 35 | 1 | 1 | 33 | 0 | 35 | 34 |

Average voltage = 0.416 volts

Note: The 'Number of Indications' column includes both DSI and DSS indications. DSI indications that were tested, but not confirmed, by MRPC were converted to a DSS designation. The average voltage is for the combined set of DSI and DSS indications.

The 0.94 volt DSI located in the Flow Distribution Baffle (FDB) region of R5C83(H1) is included in the table.

Table 3-4: Inspection Results for SG 4 EOC-11

| Voltage Bin | Number of Indications (see notes) | MRPC Confirmed | MRPC Tested But Not Confirmed | Not MRPC Tested | Plugged | Returned to Service | In-Service MRPC Confirmed or not Tested |
|---|---|---|---|---|---|---|---|
| 0.2 | 15 | | | 15 | | 15 | 15 |
| 0.3 | 44 | | | 44 | | 44 | 44 |
| 0.4 | 68 | | 1 | 67 | | 68 | 67 |
| 0.5 | 51 | | | 51 | | 51 | 51 |
| 0.6 | 29 | 2 | | 27 | | 29 | 29 |
| 0.7 | 24 | | | 24 | | 24 | 24 |
| 0.8 | 15 | | | 15 | | 15 | 15 |
| 0.9 | 12 | | | 12 | | 12 | 12 |
| 1 | 3 | | | 3 | | 3 | 3 |
| Total | 261 | 2 | 1 | 258 | 0 | 261 | 260 |

Average voltage = 0.446 volts

Note: This summary includes the SG4 H11 intersection of Row 1 Column 100. This intersection did not have a Bobbin DSI indication but did have an MRPC SAI indication. It had a 0.29 Volt SAI call by MRPC. From a linear regression of DSI voltages with confirmed MRPC voltages it is estimated that this intersection had a 0.60 volt DSI (thus placing it in the 0.6 voltage bin).

Note: The 'Number of Indications' column includes both DSI and DSS indications. DSI indications that were tested, but not confirmed, by MRPC were converted to a DSS designation. The average voltage is for the combined set of DSI and DSS indications.

Table 3-5: Inspection Results for All Steam Generators for EOC-11

| Voltage Bin | Number of Indications (see notes) | MRPC Confirmed | MRPC Tested But Not Confirmed | Not MRPC Tested | Plugged | Returned to Service | In-Service MRPC Confirmed or not Tested |
|---|---|---|---|---|---|---|---|
| 0.1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0.2 | 34 | 0 | 0 | 34 | 0 | 34 | 34 |
| 0.3 | 78 | 0 | 0 | 78 | 0 | 78 | 78 |
| 0.4 | 79 | 0 | 3 | 76 | 1 | 78 | 76 |
| 0.5 | 67 | 0 | 1 | 66 | 0 | 67 | 66 |
| 0.6 | 37 | 3 | 0 | 34 | 0 | 37 | 37 |
| 0.7 | 29 | 1 | 0 | 28 | 0 | 29 | 29 |
| 0.8 | 17 | 0 | 0 | 17 | 0 | 17 | 17 |
| 0.9 | 14 | 0 | 0 | 14 | 1 | 13 | 13 |
| 1 | 5 | 0 | 0 | 5 | 0 | 5 | 5 |
| 1.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.3 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| Total | 362 | 5 | 4 | 353 | 3 | 359 | 356 |

Average voltage = 0.424 volts

Note: The 'Number of Indications' column includes both DSI and DSS indications. DSI indications that were tested, but not confirmed, by MRPC were converted to a DSS designation. The average voltage is for the combined set of DSI and DSS indications.

The 0.94 volt DSI located in the Flow Distribution Baffle (FDB) region of R5C83(H1) of SG 3 is included in the table. This summary includes the SG4 H11 intersection of Row 1 Column 100. This intersection did not have a Bobbin DSI indication but did have an MRPC SAI indication. It had a 0.29 Volt SAI call by MRPC. From a linear regression of DSI voltages with confirmed MRPC voltages it is estimated that this intersection had a 0.60 volt DSI (thus placing it in the 0.6 voltage bin).

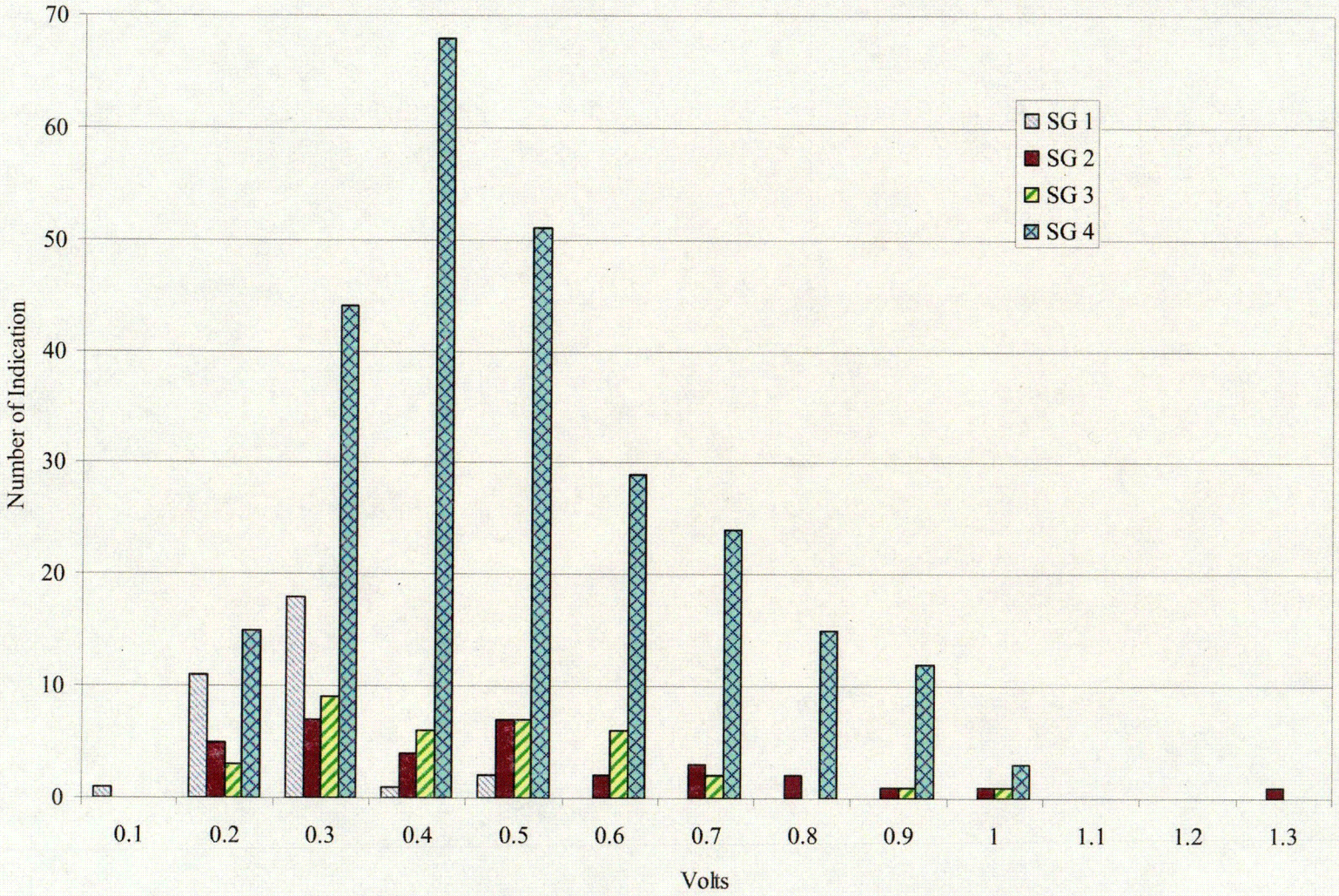


Figure 3-1: Comanche Peak-1 EOC-11 Voltage Distribution, by SG

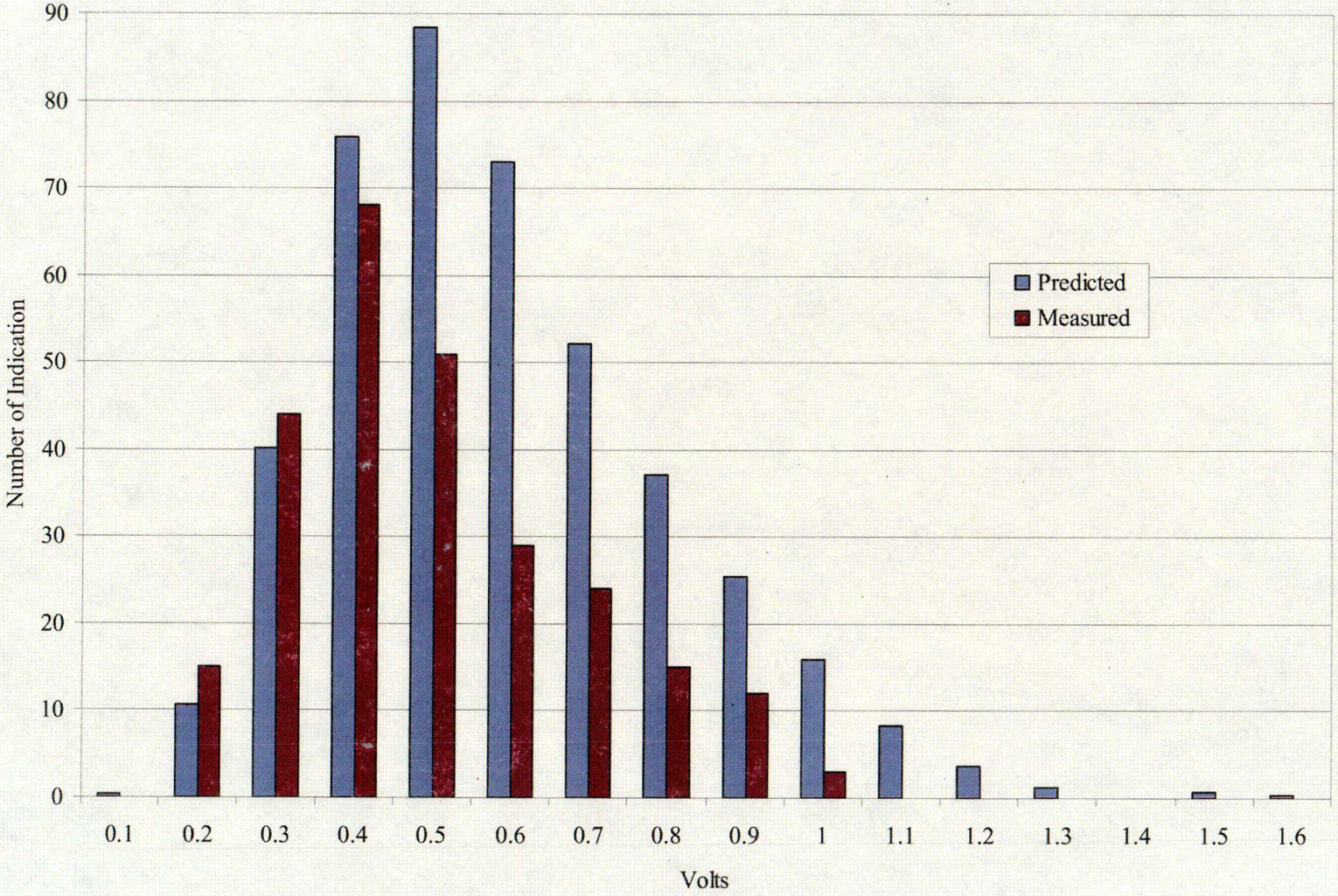


Figure 3-2: Comanche Peak-1 EOC-11 Voltage Distribution, SG 4



C02

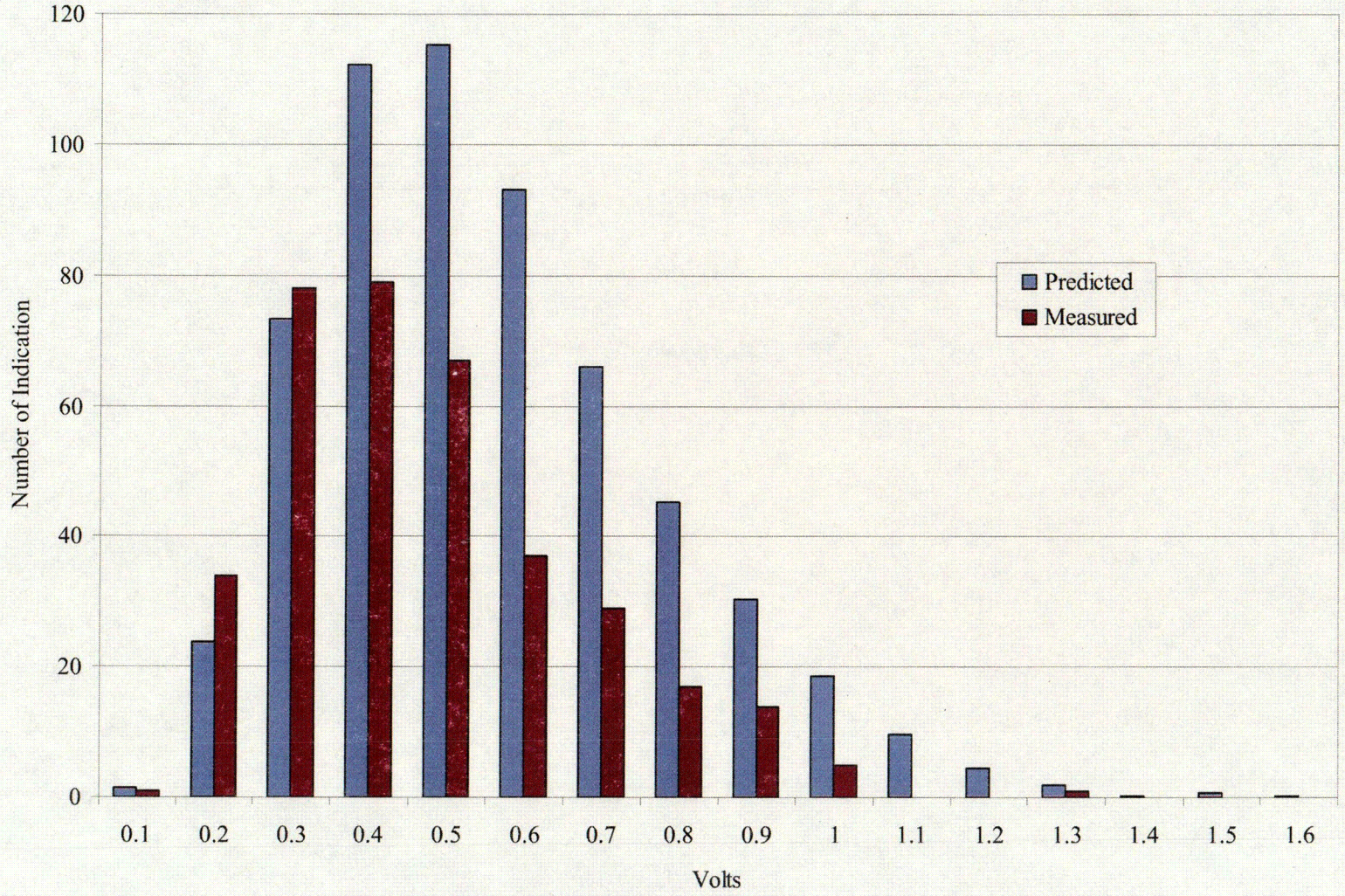


Figure 3-3: Comanche Peak-1 EOC-11 Voltage Distribution, All SGs

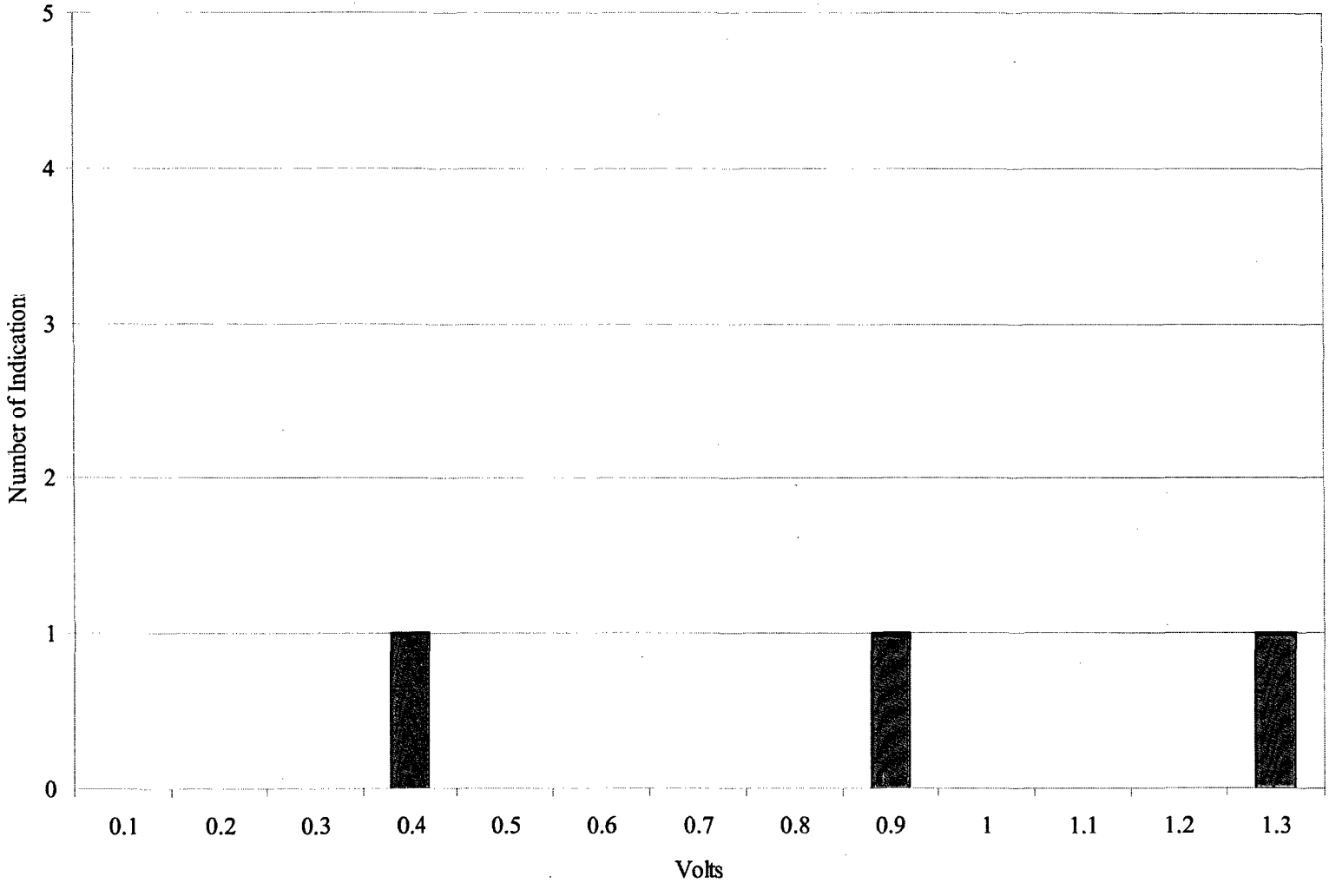


Figure 3-4: Comanche Peak-1 EOC-11 Repaired Indications, All SGs

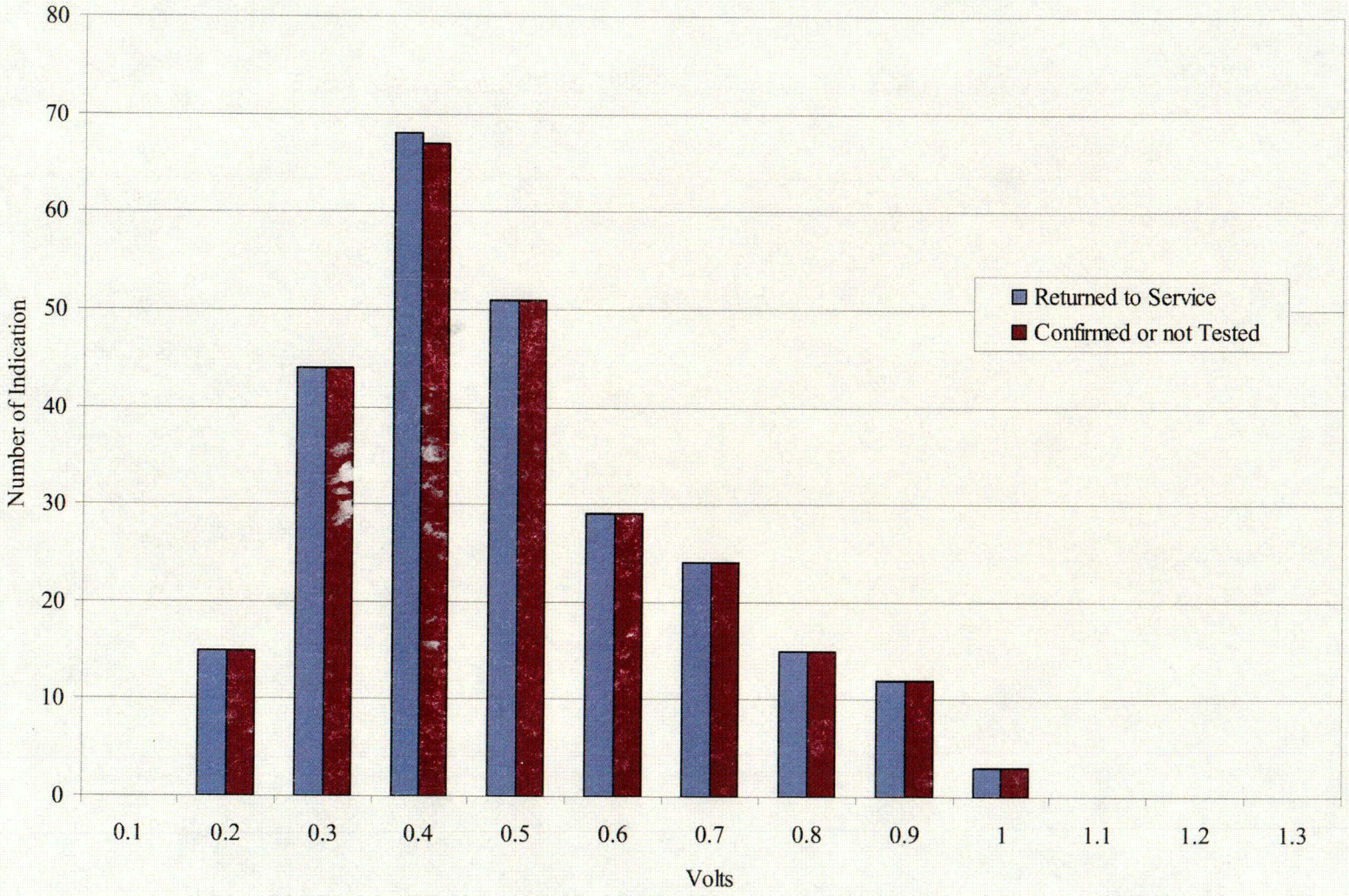


Figure 3-5: Comanche Peak-1 EOC-11 Indications Returned to Service, SG 4



C04

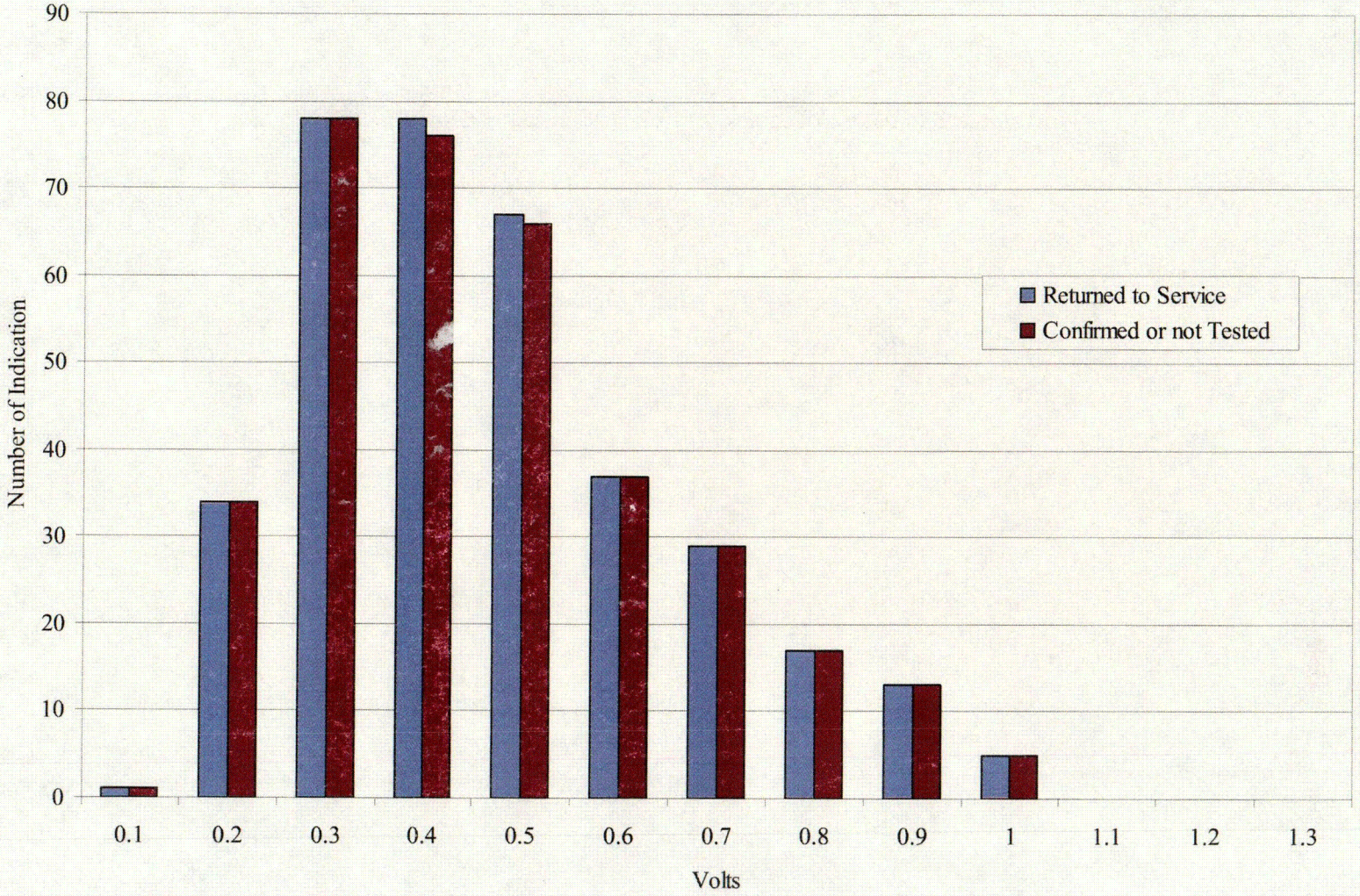


Figure 3-6: Comanche Peak-1 EOC-11 Indications Returned to Service, All SGs

## 3.2 VOLTAGE GROWTH RATES FOR CYCLE 11

Voltage growth was determined by the difference between the EOC-11 and EOC-10 voltages for each indication. The EOC-10 voltages were determined by historical reviews of the prior cycle data base and were established using the same techniques as used to analyze the EOC-11 data. The voltage change is for the 517.35 EFPD cycle length of Cycle 11. The voltage at EOC-10 is provided for indications detected at EOC-11 in Appendix A.

The procedure for computing the voltage change and binning the values is described in Reference 3. Negative voltage changes are included in the 0 change bin; however for the determination of the average growth rate for each steam generator the negative voltage changes were included. For cases where an EOC-11 indication did not have a corresponding EOC-10 indication, that EOC-11 indication was not included in the growth rate determination. Voltage change distributions for each steam generator are included in Table 3-6 through Table 3-9. These tables also include the average percent change in voltage, obtained for each steam generator by dividing the average change in volts (from EOC-10 to EOC-11) by the average EOC-10 voltage.

A comparison of the EOC-11 steam generator specific growth rates and a composite of all steam generator growth rates are shown in Figure 3-7 and the tail end is shown in detail in Figure 3-8. While the growth rate distribution of SG 2 appears to be the bounding distribution, it is based on only 32 indications, which is less than the 200 indications required by GL 95-05 for use as a growth rate distribution. Likewise, SG 3 has far less than the required 200 indications The combined growth rate from all steam generators (which is based on 357 indications) bounds that of SG 4 (which is based on 259 indications) in the tail end of the curve which indicates that it is the bounding distribution for leak rate and burst probability projections. This bounding composite steam generator EOC-11 specific growth rate distribution that was used is provided in Table 3-10.

Figure 3-9 presents a comparison of the bounding growth rates from Cycle 10 with that from Cycle 11. The data has been normalized to a 1 EFPY basis (365.25 EFPD). Figure 3-10 provides a detailed view of the tail of the curve. From these figures it is clear that the composite steam generator growth rate in Cycle 11 bounds that of Cycle 10, thus the Cycle 11 growth rate is used in the projections for Cycle 12.

Figure 3-11 presents a plot of the voltage growth as a function of the BOC voltage. A regression line of the data is also included. The coefficient of determination for the regression ($R^2 = 0.0066$) indicates that growth is not dependent on BOC voltage.

Table 3-6: Voltage Changes from EOC-10 to EOC-11, SG 1

| SG 1 | | |
|---|---|---|
| **Change in Volts** | **Number of Indications** | **Cumulative Distribution** |
| 0 | 18 | 0.563 |
| 0.1 | 12 | 0.938 |
| 0.2 | 2 | 1.000 |
| Total | 32 | |

Average change = growth / EOC-10 volts = -3.7%

Table 3-7: Voltage Changes from EOC-10 to EOC-11, SG 2

| SG 2 | | |
|---|---|---|
| **Change in Volts** | **Number of Indications** | **Cumulative Distribution** |
| 0 | 8 | 0.250 |
| 0.1 | 16 | 0.750 |
| 0.2 | 6 | 0.938 |
| 0.3 | | 0.938 |
| 0.4 | 1 | 0.969 |
| 0.5 | | 0.969 |
| 0.6 | | 0.969 |
| 0.7 | 1 | 1.000 |
| Total | 32 | |

Average change = growth / EOC-10 volts = 15.1%

Table 3-8: Voltage Changes from EOC-10 to EOC-11, SG 3

| SG 3 | | |
|---|---|---|
| **Change in Volts** | **Number of Indications** | **Cumulative Distribution** |
| 0 | 11 | 0.324 |
| 0.1 | 15 | 0.765 |
| 0.2 | 6 | 0.941 |
| 0.3 | 1 | 0.971 |
| 0.4 | 1 | 1.000 |
| Total | 34 | |

Average change = growth / EOC-10 volts = 8.9%

Table 3-9: Voltage Changes from EOC-10 to EOC-11, SG 4

| SG 4 | | |
|---|---|---|
| **Change in Volts** | **Number of Indications** | **Cumulative Distribution** |
| 0 | 83 | 0.320 |
| 0.1 | 121 | 0.788 |
| 0.2 | 45 | 0.961 |
| 0.3 | 6 | 0.985 |
| 0.4 | 4 | 1.000 |
| Total | 259 | |

Average change = growth / EOC-10 volts = 11.3%

Table 3-10: Voltage Changes from EOC-10 to EOC-11, Composite of All SGs

| Composite of All SGs | | |
|---|---|---|
| **Change in Volts** | **Number of Indications** | **Bounding Cumulative Distribution** |
| 0 | 120 | 0.336 |
| 0.1 | 164 | 0.796 |
| 0.2 | 59 | 0.961 |
| 0.3 | 7 | 0.980 |
| 0.4 | 6 | 0.997 |
| 0.5 | | 0.997 |
| 0.6 | | 0.997 |
| 0.7 | 1 | 1.000 |
| Total | 357 | |

Average change = growth / EOC-10 volts = 10.6%

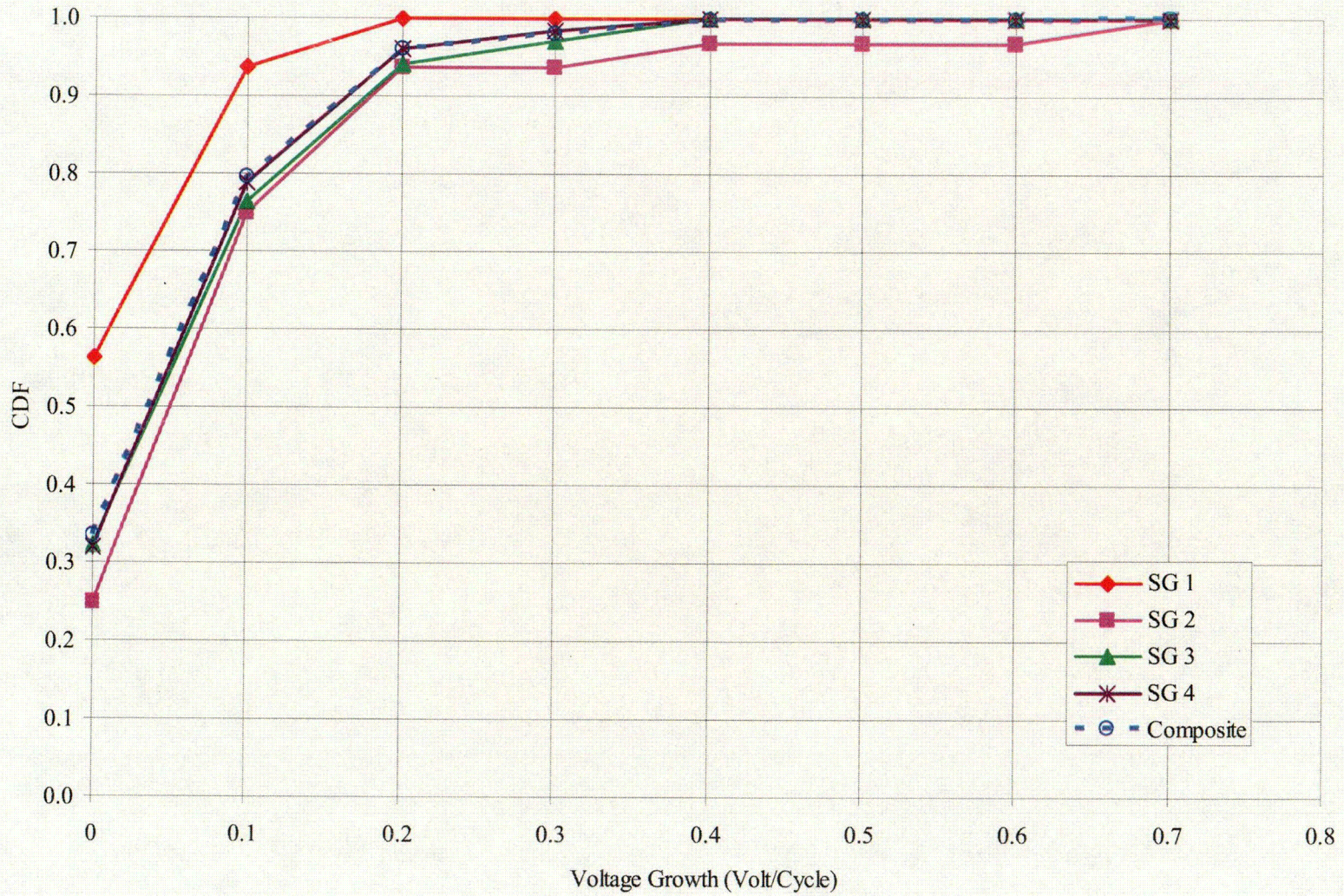


Figure 3-7: Comanche Peak-1 Voltage Growth per Cycle 11

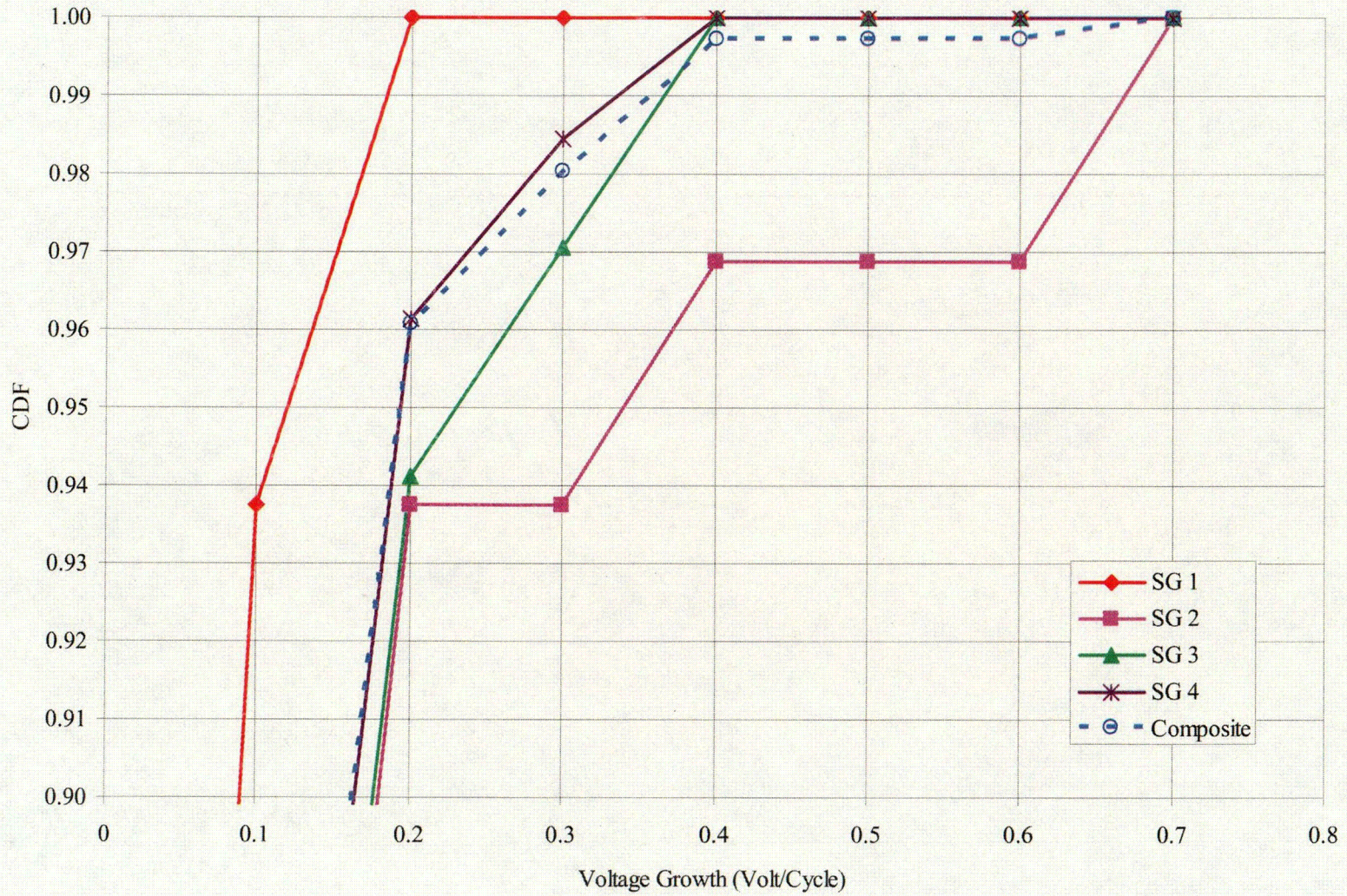


Figure 3-8: Comanche Peak-1 Voltage Growth Detail



C07

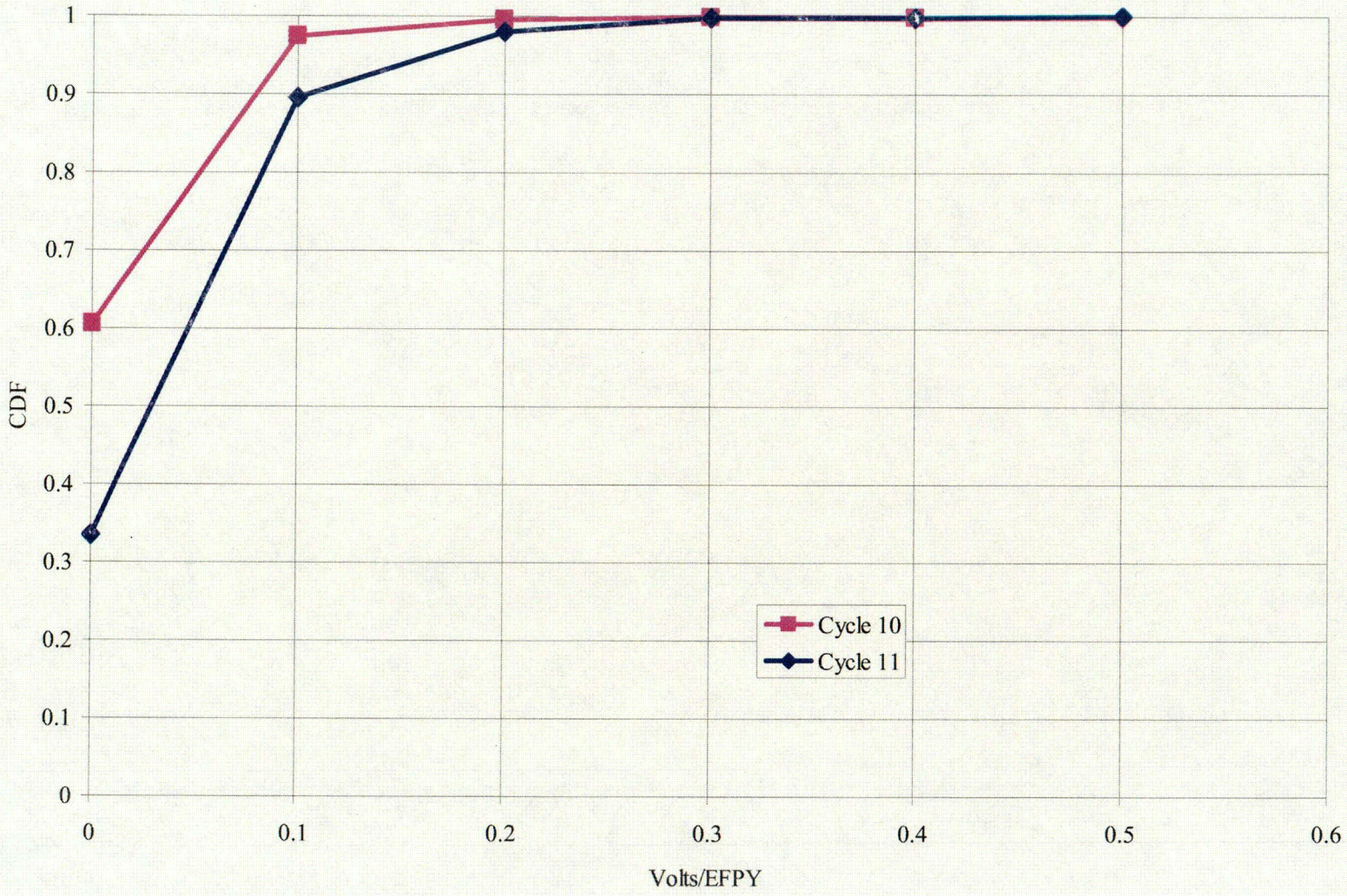


Figure 3-9: Cycle 10 and Cycle 11 Bounding Growth Rates, per EFPY

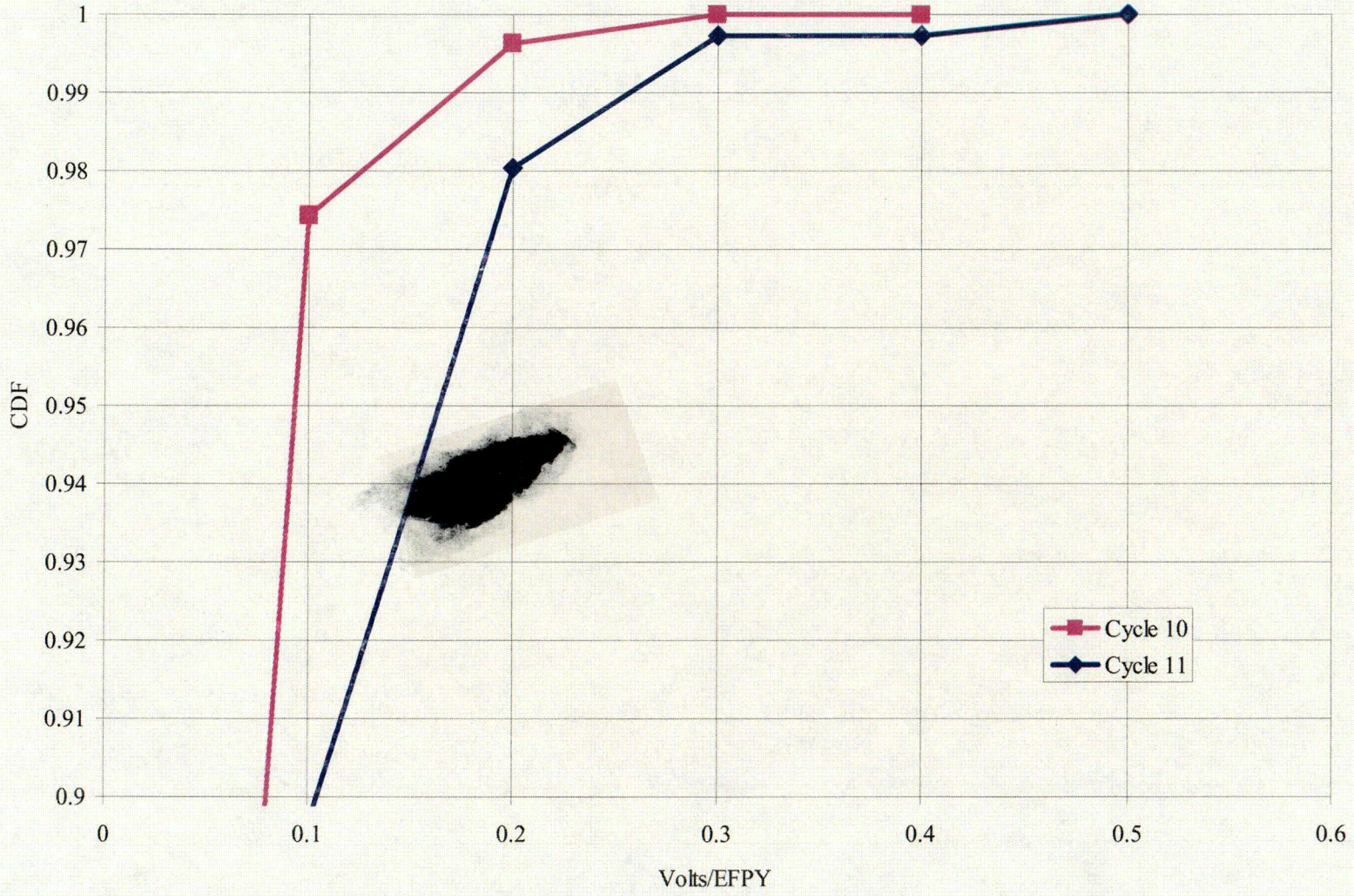


Figure 3-10: Cycle 10 and Cycle 11 Bounding Growth Rates, per EFPY, Detail View

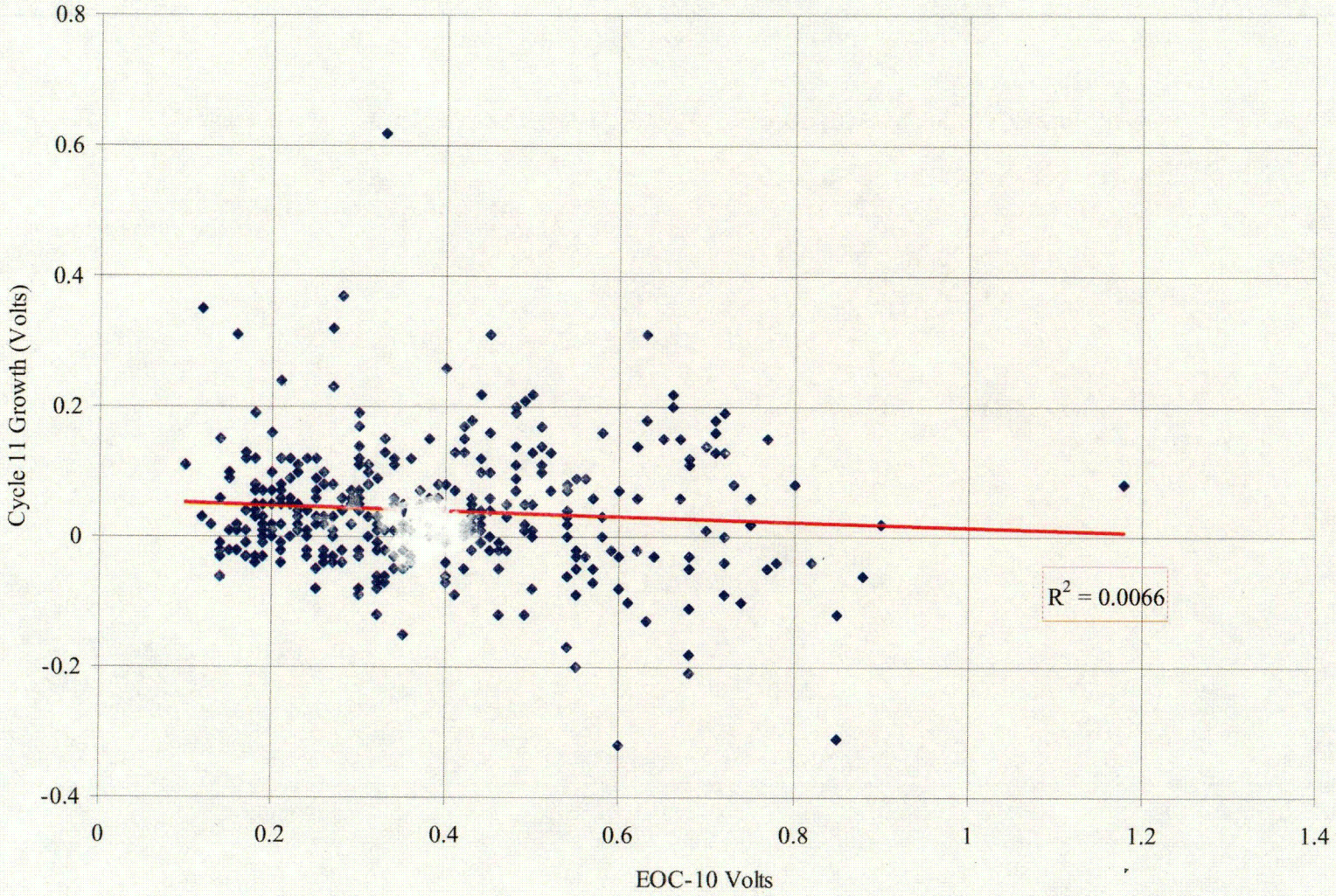


Figure 3-11: Growth as a Function of BOC Voltage



C10

# 4.0 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 probability of burst and leakage at accident conditions is based on the Westinghouse Topical Report, WCAP-14277, Revision 1 (Reference 3) supplemented by recent changes in the leakage computation process, discussed in Reference 8 as amended in Reference 9. The EOC voltage distribution, probability of burst and the leakage are computed using the Cyclesim3.1 program.

The predictions for EOC-11 recorded in Reference 5 used the tube burst and leakage correlations of Addendum 5 to EPRI Report NP-7480-L (Reference 10) modified according to References 8 and 9. Both the condition monitoring assessment for EOC-11 and the operational assessment predicting the EOC-12 voltage distribution are performed using the Addendum 6 database (Reference 6). The condition monitoring and operational assessments are performed using the leakage correlation for 2560 psi (Reference 2). The specific parameters used in the correlations are provided in Sections 4.1 through 4.4.

## 4.1 TUBE MATERIAL PROPERTIES

The tube material properties are provided in Reference 3 (Table 4-1) for 3/4-inch diameter tubes at 650°F. The parameters used in the analysis are the flow stress mean of 71.565 ksi and the flow stress standard deviation of 3.567 ksi.

## 4.2 BURST CORRELATION

The burst pressure, $P_b$, is normalized to a material with a flow stress of 71.565 ksi, which is the mean of the 3/4-inch tube data appropriate for Comanche Peak Unit 1. The correlation parameters are taken from Reference 6.

Table 4-1: Effect of Database Changes on the 3/4" Tube Burst Pressure vs. Bobbin Amplitude Correlation

$$P_B = a_0 + a_1 \log(Volts)$$

| Parameter | Addendum 5 Database Value | Addendum 6 Database Value | New / Old Ratio |
|---|---|---|---|
| Intercept, $a_0$ | 7.4605 | 7.4403 | 0.997 |
| Slope, $a_1$ | -2.9572 | -2.9679 | 1.004 |
| Index of Deter., $r^2$ | 80.70% | 80.2% | 0.994 |
| Std. Error, $\sigma_{Error}$ | 0.9009 | 0.9101 | 1.010 |
| Mean of log(V) | 0.3994 | 0.4018 | |
| SS log(V) | 37.2648 | 37.3292 | |
| $N$ (data pairs) | 98 | 100 | |
| Str. Limit (2560 psi) (1) | 4.85 V | 4.70 | 0.968 |
| Str. Limit (2405 psi) (1) | 5.67 V | 5.65 | 0.968 |
| $p$ Value for $a_1$ (2) | $2.27 \cdot 10^{-36}$ | $1.54 \cdot 10^{-36}$ | |
| Reference $\sigma_f$ | 71.565 | | |

Notes: (1) Values reflect a safety factor of 1.4 on the differential pressure associated with the postulated SLB event.

(2) Numerical values are reported only to demonstrate compliance with the requirement that the value be less than 0.05.

## 4.3 LEAK RATE CORRELATION

The leak rate correlation as a function of indication voltage is taken from Reference 6. The steam line break pressure is given as 2560 psi in Reference 2. The leak rate criterion is given in terms of gallons per minute condensed at room temperature.

Table 4-2: Effect of Added Data on the 3/4" Tubes Leak Rate vs. Bobbin Amplitude Correlation

$$Q = 10^{[b_3 + b_4 \log(Volts)]}$$

| Parameter | Addendum 5 Database Value | Addendum 6 Database Value | New / Old Ratio |
|---|---|---|---|
| **SLB ΔP = 2560 psi** | | | |
| Intercept, $b_3$ | -1.6384 | -1.5208 | 0.928 |
| Slope, $b_4$ | 2.9409 | 2.8347 | 0.964 |
| Index of Determination, $r^2$ | 61.6% | 61.5% | 0.999 |
| Std. Deviation, $\sigma_{Error}$ ( $b_5$ ) | 0.6064 | 0.6033 | 0.995 |
| Mean of log($Q$) | 1.0702 | 1.0450 | |
| SS of log($Q$) | 0.9679 | 0.9623 | |
| $p$ Value for $b_2$ | $2.1 \cdot 10^{-11}$ | $8.1 \cdot 10^{-12}$ | 0.396 |
| **SLB ΔP = 2405 psi** | | | |
| Intercept, $b_3$ | -1.8708 | -1.7849 | 0.954 |
| Slope, $b_4$ | 2.9767 | 2.8990 | 0.974 |
| Index of Determination, $r^2$ | 62.8% | 63.6% | 1.012 |
| Std. Deviation, $\sigma_{Error}$ ( $b_5$) | 0.5979 | 0.5904 | 0.988 |
| Mean of log(Q) | 0.8707 | 0.8391 | |
| SS of log(Q) | 0.9700 | 0.9681 | |
| $p$ Value for $b_2$ | $9.6 \cdot 10^{-12}$ | $2.1 \cdot 10^{-12}$ | 0.222 |
| Common Data | | | |
| Data Pair, $N$ | 48 | 50 | |
| Mean of Log($V$) | 0.9210 | 0.9051 | |
| SS of Log($V$) | 3.1348 | 3.4733 | |

## 4.4 PROBABILITY OF LEAK CORRELATION

The probability of leak as a function of indication voltage is taken from Reference 6. 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.

Table 4-3: Effect of Additional Data on the 3/4" Tube Probability of Leak Correlation

$$\Pr(\mathit{Leak}) = \frac{1}{1+e^{-\left[b_1+b_2\log(\mathit{Volts})\right]}}$$

| Parameter | Addendum 5 Database Value | Addendum 6 Database Value | New / Old Ratio |
|---|---|---|---|
| Logistic Intercept, $b_1$ | -4.8270 | -4.4637 | 0.925 |
| Logistic Slope, $b_2$ | 8.4488 | 8.0947 | 0.958 |
| Intercept Variance, $V_{11}$ (1) | 1.1623 | 0.9392 | 0.808 |
| Covariance, $V_{12}$ | -1.7094 | -1.4115 | 0.826 |
| Slope Variance, $V_{22}$ | 2.8755 | 2.4739 | 0.860 |
| No. of Data, $N$ | 125 | 127 | |
| Deviance | 45.90 | 49.93 | 1.088 |
| Mean Square Error | 0.37 | 0.874 | 0.904 |
| Pearson Std. Deviation | 0.97 | 0.399 | 1.071 |

Notes: (1) Parameters $V_{ij}$ are elements of the covariance matrix of the coefficients, $b_i$, of the regression equation.

## 4.5 NDE UNCERTAINTIES

The NDE uncertainties applied for the EOC-11 and EOC-12 voltage projections are the same as used in the previous 90-day report, Reference 5, and described in Reference 3. 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-11, and EOC-12. The voltages reported were adjusted to account for differences between the laboratory standard and the standard used in the field.

## 4.6 UPPER VOLTAGE REPAIR LIMIT

The upper voltage repair limit is based on the structural limit in Table 4-1 of 4.70 volts for accident pressure of 2560 psi. It must be reduced by considering the projected voltage growth during the next cycle and NDE uncertainty. According to Reference 1, the minimum growth

adjustment is 30% per EFPY, which exceeds any average percentage growth rate for any steam generator (Table 3-6 through Table 3-10). Therefore, for the anticipated 480 EFPD Cycle 12, the specific maximum value of 30% x (480/365.25) = 39.4% and 20% for NDE uncertainty will be used to estimate the voltage repair limit. This results in an upper voltage repair limit of 4.70 / (1 + 0.394 + 0.20) = 2.95 volts. No indications equal to or greater than this voltage were left in service.

The structural limit for FDB intersections is lower because it is based on meeting structural integrity at 3 times normal operating pressure differential (3855 psi). The upper voltage repair limit for FDB intersections is based on the structural limit from Figure 6-2 of Reference 6 of 3.73 volts for a free span burst pressure of 3855 psi. It must be reduced by considering the projected voltage growth during the next cycle and NDE uncertainty. The growth rate in the single FDB indication (0.31 volt/cycle) was less than the maximum growth rate in other TSP regions (0.62 volt/cycle) and thus special consideration of growth rate in the FDB region is not required. According to Reference 1, the minimum growth adjustment is 30% per EFPY, which exceeds any average percentage growth rate for any steam generator (Table 3-6 through Table 3-10). Therefore, for the anticipated 480 EFPD Cycle 12, the specific maximum value of 30% x (480/365.25) = 39.4% and 20% for NDE uncertainty will be used to estimate the voltage repair limit. This results in an upper voltage repair limit of 3.73 / (1 + 0.394 + 0.20) = 2.34 volts. No indications equal to or greater than this voltage were left in service.

GL 95-05 (Reference 1) allows use of smaller or larger probes when it is impractical to utilize the nominal 0.61 inch diameter bobbin probe for 0.75 inch OD tubing. For tubes tested with a reduced diameter probe (i.e., 0.54 inch or 0.52 inch wide groove probe) the following repair criterion was applied during the EOC-11 inspection of TSP regions. Testing of probes (0.54 inch and 0.52 inch wide groove and 0.61 inch standard bobbin) performed during the EOC-10 inspection has shown that smaller diameter wide groove probes yield larger amplitudes than the larger probes for the same indications. Despite this observation, the upper voltage repair limit was adjusted downward to 2.0 volts for conservatism. All tubes with DSIs, reported from 0.54 inch or 0.52 inch bobbin probe inspection (with no 0.61 inch bobbin data during the outage), with amplitudes exceeding the adjusted upper voltage repair limit (AUVRL) of 2.0 volts were to be plugged, regardless of MRPC confirmation. All DSI indications, reported from 0.54 inch or 0.52 inch wide groove probe bobbin inspection (with no 0.61 inch bobbin data during the outage) were to be MRPC inspected. Tubes with DSIs resulting from 0.54 inch or 0.52 inch wide groove probe bobbin inspection (without 0.61 inch bobbin data during the outage) were to be plugged if confirmed as crack-like by MRPC inspection results regardless of bobbin voltage. DSIs reported from wide groove probe bobbin inspection with amplitudes below the AUVRL (2.0 volts) and not confirmed as crack-like by MRPC, were to be returned to service.

No indications equal to or greater than these voltages were found. No indications were plugged or repaired because they exceeded any upper voltage repair limit or AUVRL.

## 4.7 PROBE WEAR

An alternate probe wear criteria, approved by the NRC (Reference 7), was applied during the EOC-11 inspection. When a probe does not satisfy the ±15% voltage variability criteria for wear,

this alternate criteria requires that all tubes that have indications above 75% of the repair limit inspected since the last successful probe wear check be reinspected with a good probe. All probes that failed the wear check were immediately replaced with a new probe. In accordance with this alternate probe wear criteria, the whole tube was re-inspected with a good probe when any part of the tube exceeded 75% of the repair limit. As the repair limit for Comanche Peak Unit 1 is 1 volt, all tubes that contained worn probe indications above 0.75 volts were re-inspected with a new probe. In the cases where the original call made with the worn probe was greater than 0.75 volts, the signal amplitude obtained with the new probe was used in these analyses.

Only one (1) indication with a bobbin DSI voltage above 0.75 volts was found in the calibration groups that failed the probe wear check (these indications are called 'RPW'), and the tube containing this indication was reinspected with a new probe. The indication measured 0.81 volts with the worn probe and 0.81 volts also with the good probe. This indicates that the magnitude of the indication measured by the worn and good probes was not significantly different.

The indications found in the current inspection that were tested with a worn probe in the previous (EOC-10) inspection were identified (Table 4-4). These indications had sufficiently small voltages so that a retest was not required during the EOC-10 inspection. Of the 7 indications found in the current inspection that were tested with a worn probe in the previous inspection, none were equal to or greater than 0.5 volts. Of the 285 indications found in the current inspection that were tested with a good probe in the previous inspection, 81 were equal to or greater than 0.5 volts. There is no significant difference in the fraction of larger indications for tubes previously tested with a worn probe.

As required by Reference 7, the number of new indications detected in the present inspection in tubes that were inspected with a worn probe in the last inspection was also determined (Table 4-5). Out of a total of 76 new indications reported in the current inspection, only one (1) was in a tube inspected with a worn probe during the last inspection. The ratio of new indications that were identified in tubes tested with a worn probe in EOC-10 to the number of tubes tested with a worn probe in EOC-10 for all SGs is 0.0009. The ratio of new indications that were identified in tubes tested with a good probe in EOC-10 to the number of tubes tested with a good probe in EOC-10 for all SGs is 0.0044. The percentage of new indications in tubes tested with a worn probe equal to or greater than 0.5 V for all SGs is 0%, and the percentage of new indications in tubes tested with good probe equal to or greater than 0.5 V for all SGs is 16%. The small number of indications tested with a worn probe prevents a quantitative comparison, but it is clear that there is no evidence that tubes tested with worn probes in the previous inspection contain a greater proportion of new indications than tubes tested with a good probe. These results indicate that there is no increase in the rate of occurrence or magnitude of new indications found in the EOC-11 inspection due to testing with a worn probe in the EOC-10 inspection. Thus, the requirements specified in Reference 7 for applying the alternate probe wear criteria are met.

Table 4-4: Commanche Peak Unit 1 Tube Status Prior to 2005 Inspection (EOC-11)

| SG | Original Tubes | Number Of Open Tubes at EOC-11 | Number of Tubes Tested with Worn Probe at EOC-10 (Hot Leg) |
|---|---|---|---|
| 1 | 4578 | 4517 | 336 |
| 2 | 4578 | 4500 | 100 |
| 3 | 4578 | 4481 | 172 |
| 4 | 4578 | 4478 | 484 |
| Total | 18312 | 17976 | 1092 |

Table 4-5: Worn Probe Analysis - New Indications

| All Steam Generators Combined | | |
|---|---|---|
| Number of new indications in EOC-11 | | 76 |
| Worn Probe in EOC-10 | Number of new indications tested with worn probe in EOC-10 | 1 |
| | Number of these equal to or greater than 0.5 V in EOC-11 | 0 |
| | Number of tubes tested with worn probe | 1092 |
| Good Probe in EOC-10 | Number of new indications tested with good probe in EOC-10 | 75 |
| | Number of these equal to or greater than 0.5 V in EOC-11 | 12 |
| | Number of tubes tested with good probe | 16884 |
| Ratio of new indications in tubes tested with worn probe to number of tubes tested with a worn probe | | 1/1092 = 0.0009 |
| Ratio of new indications in tubes tested with good probe to number of tubes tested with a good probe | | 75/16884 =0.0044 |
| Percentage of new indications in tubes tested with worn probe equal to or greater than 0.5 V | | 0 = 0% |
| Percentage of new indications in tubes tested with good probe equal to or greater than 0.5 V | | 12/75 = 16% |
| | | |
| Number of previous indications in EOC-11 | | 285 |
| Worn Probe in EOC-10 | Number of prev indications tested with worn probe in EOC-10 | 7 |
| | Number of these exceeding 1.0 V in EOC-11 | 0 |
| | Highest voltage indication of these | 0.44V |

# 5.0 CONDITION MONITORING: TUBE LEAK RATE AND BURST PROBABILITIES AT EOC-11

## 5.1 ANALYSIS APPROACH

The measured EOC-11 voltage distributions of Table 3-1 through Table 3-4 for each steam generator are used as the basis for the leak rate and burst probability predictions for EOC-11. The voltage distributions developed for the computation of POB and leakage consider NDE uncertainty on the measured values, but consider no voltage growth. The resulting voltage distributions used for computation of the probability of burst and leakage are given in Figure 5-1 through Figure 5-4.

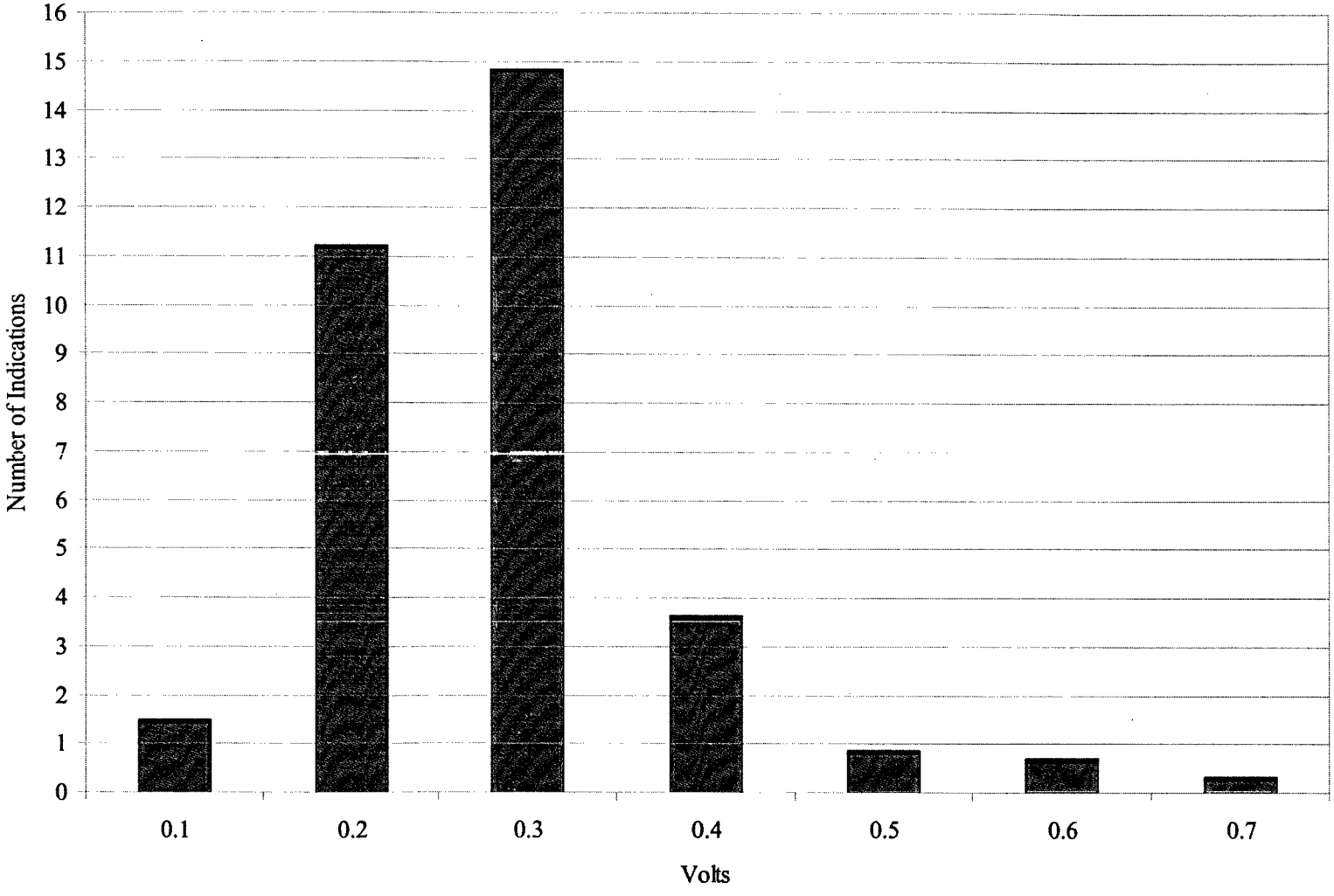


Figure 5-1: Voltage Distribution with NDE Uncertainty, SG 1

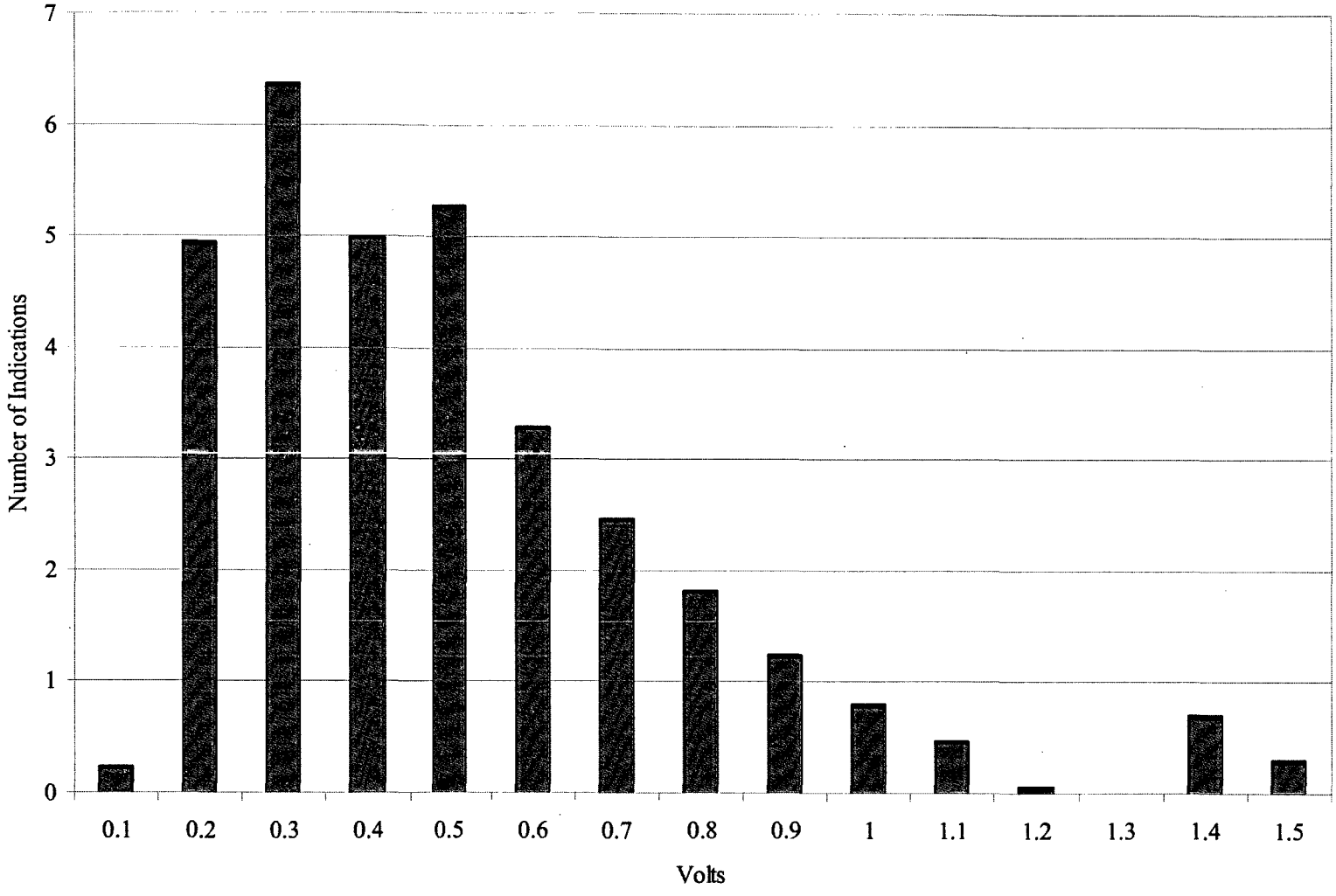


Figure 5-2: Voltage Distribution with NDE Uncertainty, SG 2

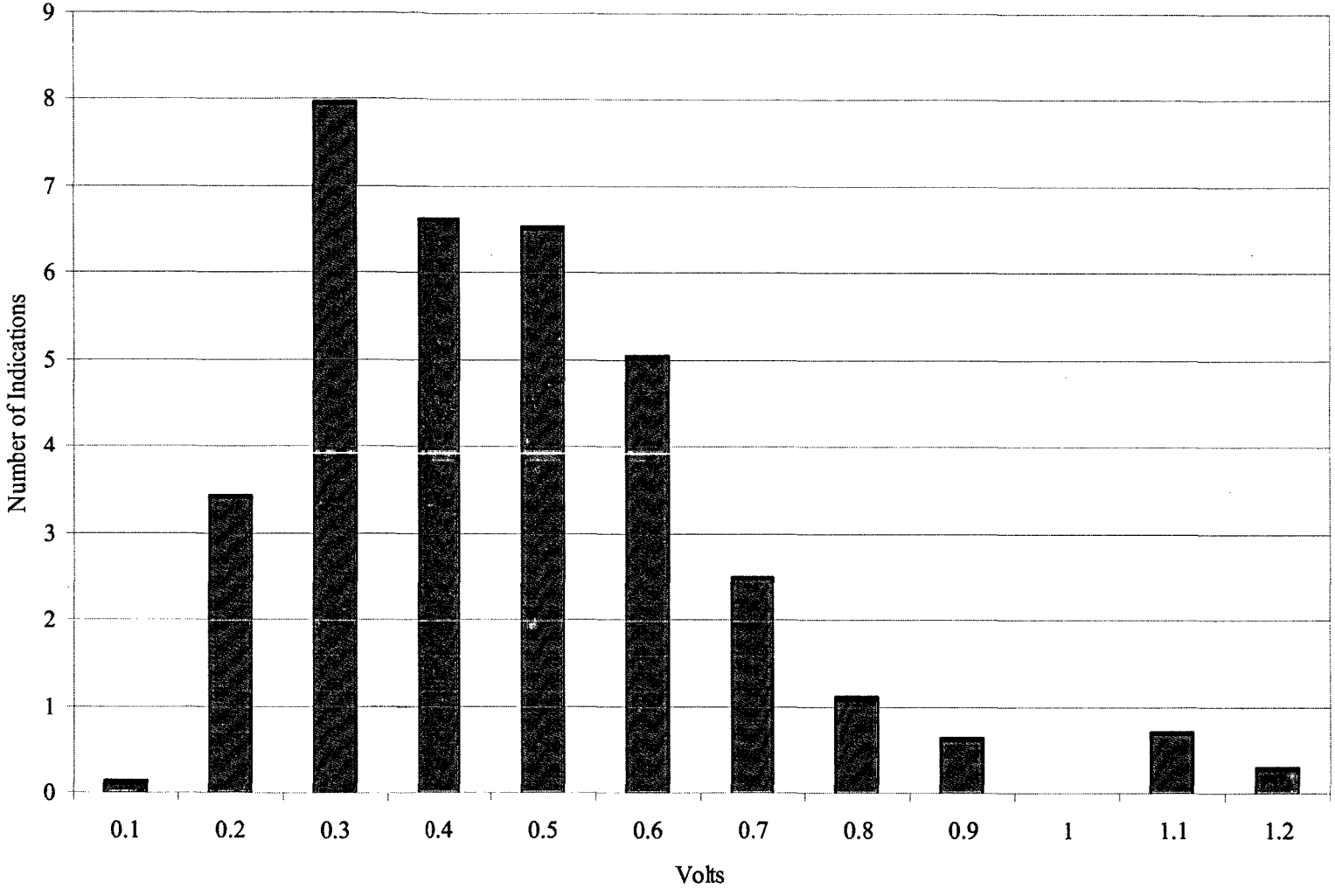


Figure 5-3: Voltage Distribution with NDE Uncertainty, SG 3

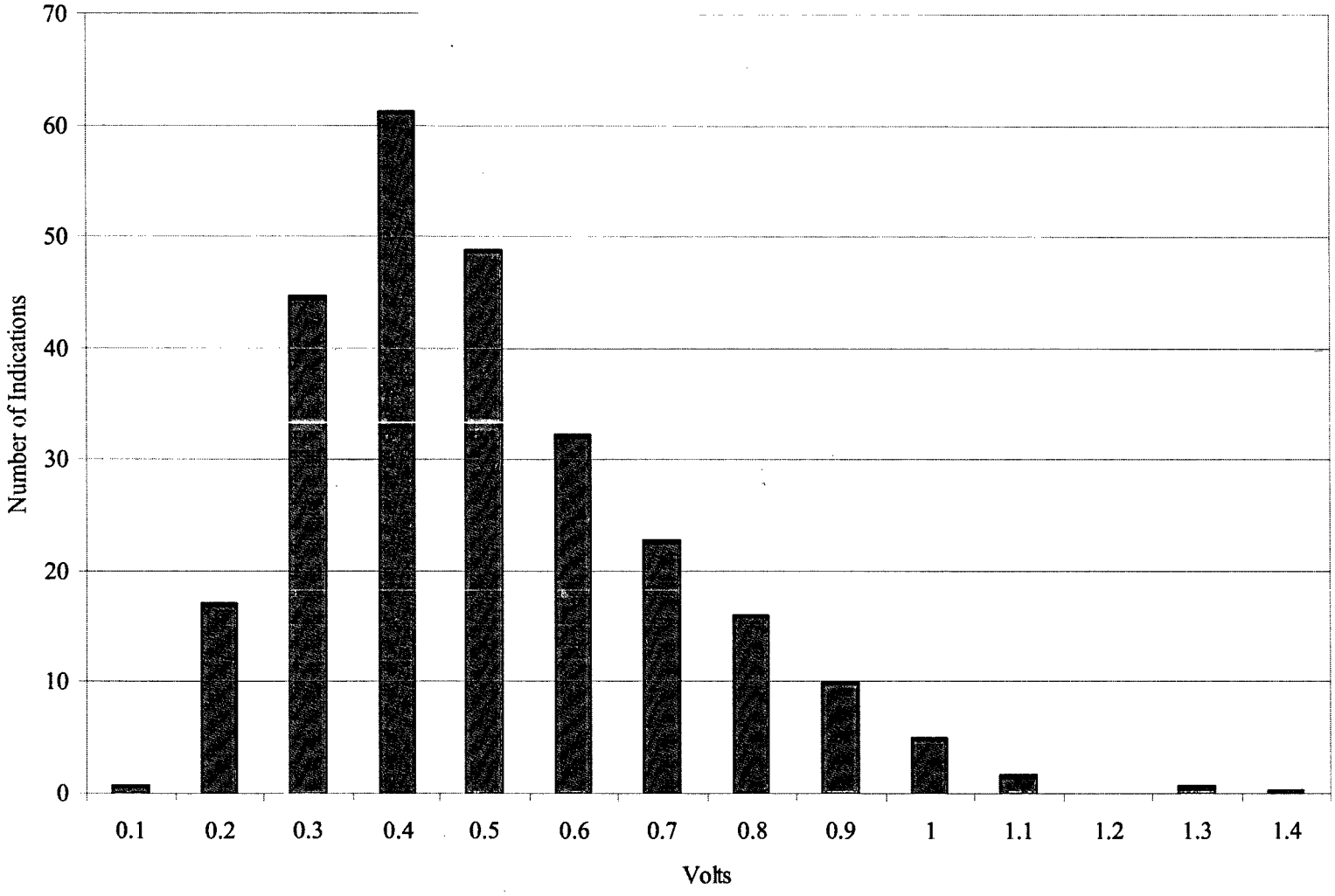


Figure 5-4: Voltage Distribution with NDE Uncertainty, SG 4

## 5.2 EOC-11 BURST PROBABILITIES AND LEAK RATES

The Monte Carlo analysis results for each of the steam generators based on the measured voltage distribution at EOC-11 are shown in Table 5-1. One-quarter-million Monte Carlo trials were performed for each steam generator. The leakage rate is the 95th percentile evaluated at 95% confidence. The burst probability is 95% confidence based on the number of trials.

Table 5-2 presents the predicted results from Reference 5. Since the Reference 5 analysis used Addendum 5 (Reference 10) parameters, Table 5-1 includes the results using the Addendum 5 parameters as well.

Table 5-1: Analysis Results for EOC-11 Voltage Distributions with NDE Uncertainty

| SG | Number of Monte Carlo Trials | Number of Indications | Maximum Volts Measured | Using Parameters from Addendum | Burst Probability 95% conf. | 95/95 SLB Leak Rate, gpm |
|---|---|---|---|---|---|---|
| 1 | 250,000 | 33 | 0.45 | 6 | $1.200 \times 10^{-5}$ | 0 |
| 2 | 250,000 | 33 | 1.26 | 6 | $2.520 \times 10^{-5}$ | $1.50 \times 10^{-4}$ |
| 3 | 250,000 | 35 | 0.94 | 6 | $1.200 \times 10^{-5}$ | $9.95 \times 10^{-5}$ |
| 4 | 250,000 | 261 | 0.92 | 5 | $1.901 \times 10^{-5}$ | $4.60 \times 10^{-4}$ |
| | | | | 6 | $1.200 \times 10^{-5}$ | $7.81 \times 10^{-4}$ |
| All | 250,000 | 362 | 1.26 | 5 | $3.103 \times 10^{-5}$ | $6.99 \times 10^{-4}$ |
| | | | | 6 | $2.520 \times 10^{-5}$ | $1.16 \times 10^{-3}$ |

Table 5-2: Predicted Results (Based on a 497.72 EFPD Cycle)

| SG | Number of Monte Carlo Trials | Number of Indications | Maximum Volts Predicted | Using Parameters from Addendum | Burst Probability 95% conf. | 95/95 SLB Leak Rate, gpm |
|---|---|---|---|---|---|---|
| 4 | 250,000 | 331.3 | 1.4 | 5 | $1.200 \times 10^{-5}$ | $4.98 \times 10^{-4}$ |
| All | 250,000 | 477 | 1.4 | 5 | $1.200 \times 10^{-5}$ | $6.08 \times 10^{-4}$ |

## 5.3 COMPARISON WITH ACCEPTANCE CRITERIA AND PREDICTION

All steam generators are well below the burst acceptance criterion of $1.0 \times 10^{-2}$, and the Comanche Peak Unit 1 leakage criterion of 27.79 gpm per steam generator (Reference 2). The acceptance criteria on POB and leakage are satisfied with significant margin.

The predicted values of the probability of burst and leakage were somewhat smaller than the actual values primarily because of the extremely small values. Other factors that may have influenced the slight under prediction include the use of the Cycle 10 growth rate (which was somewhat less than that of Cycle 11 – see Figure 3-10).

The number of indications and maximum voltages were conservatively predicted for EOC-11. For SG 4, Reference 5 predicted 331.3 indications with a 1.4 volt maximum, while the actual number of indications was 261 with a 0.92 volt maximum. For all of the steam generators combined, Reference 5 predicted 477 indications with a 1.4 volt maximum, while the actual number of indications was 362 with a 1.26 volt maximum. Figure 3-2 and Figure 3-3 show that the quantity of the smaller voltage indications was underestimated but the quantity of larger voltage indications was overestimated. This is attributable to the 0.6 POD (for all indications, regardless of size) that was used to develop the predictions.

# 6.0 OPERATIONAL ASSESSMENT: TUBE LEAK RATE AND BURST PROBABILITIES AT EOC-12

## 6.1 ANALYSIS APPROACH

The BOC-12 voltage distributions are developed, within the Cyclesim3.1 program, from the measured EOC-11 distribution by considering the POD and the indications that are removed from service. The EOC-12 voltage distribution is developed considering the NDE uncertainties and voltage growth during the cycle. The Cycle 11 growth rate was used in these projections, since it bounds the Cycle 10 growth rate. The latest burst and leakage correlations, Reference 6, are used for the EOC-12 predictions. The burst probabilities and leak rates are computed using the computed EOC-12 voltage predictions to address the acceptance criteria at the end of the cycle.

## 6.2 POD

The POD used is the NRC accepted value of 0.6 for all voltages (Reference 1). The beginning of Cycle 12 (BOC-12) voltage distributions are shown in Table 6-1.

Table 6-1: BOC-12 Voltage Distributions

| | **BOC-12 Voltage Distributions** | | | |
|---|---|---|---|---|
| **Volts** | **SG 1** | **SG 2** | **SG 3** | **SG 4** |
| 0.1 | 1.67 | 0 | 0 | 0 |
| 0.2 | 18.33 | 8.33 | 5 | 25 |
| 0.3 | 30 | 11.67 | 15 | 73.33 |
| 0.4 | 0.67 | 6.67 | 10 | 113.33 |
| 0.5 | 3.33 | 11.67 | 11.67 | 85 |
| 0.6 | 0 | 3.33 | 10 | 48.33 |
| 0.7 | 0 | 5 | 3.33 | 40 |
| 0.8 | 0 | 3.33 | 1.67 | 25 |
| 0.9 | 0 | 0.67 | 1.67 | 20 |
| 1 | 0 | 1.67 | 0 | 5 |
| 1.1 | 0 | 0 | 0 | 0 |
| 1.2 | 0 | 0 | 0 | 0 |
| 1.3 | 0 | 0.67 | 0 | 0 |
| 1.4 | 0 | 0 | 0 | 0 |
| Total | 54.0 | 53.0 | 58.3 | 435.0 |

## 6.3 VOLTAGE GROWTH RATES FOR CYCLE 12

The Cycle 10 and Cycle 11 bounding voltage growth rates, shown in Figure 3-9 and Figure 3-10, indicate that the Cycle 11 growth rate is the more conservative. The Cycle 11 bounding growth rate is used in these projections.

## 6.4 PREDICTION OF VOLTAGE DISTRIBUTIONS AT EOC-12

The prediction of the EOC-12 voltage distributions is based on the BOC-12 indications and the Cycle 11 composite growth rate. The length of Cycle 12 is established at 480 effective full power days (EFPD), Reference 2. The EOC-12 predicted voltage distributions are shown in Table 6-2 and in Figure 6-1 through Figure 6-4.

Table 6-2: EOC-12 Voltage Distributions

| | **EOC-12 Voltage Distributions** | | | |
|---|---|---|---|---|
| **Volts** | **SG 1** | **SG 2** | **SG 3** | **SG 4** |
| 0.1 | 0.89 | 0.14 | 0.08 | 0.41 |
| 0.2 | 7.81 | 3.14 | 2.14 | 10.66 |
| 0.3 | 17.98 | 7.73 | 7.49 | 40 |
| 0.4 | 16.18 | 9.13 | 11.02 | 75.6 |
| 0.5 | 7.08 | 8.72 | 11.06 | 88.26 |
| 0.6 | 2.62 | 7.56 | 9.99 | 73.52 |
| 0.7 | 0.45 | 5.57 | 7.33 | 52.89 |
| 0.8 | 0.7 | 3.98 | 4.11 | 37.53 |
| 0.9 | 0.3 | 2.75 | 2.2 | 25.7 |
| 1 | 0 | 1.73 | 1.35 | 15.98 |
| 1.1 | 0 | 1.05 | 0.56 | 8.46 |
| 1.2 | 0 | 0.51 | 0 | 3.76 |
| 1.3 | 0 | 0 | 0.7 | 1.24 |
| 1.4 | 0 | 0.7 | 0.3 | 0 |
| 1.5 | 0 | 0 | 0 | 0.7 |
| 1.6 | 0 | 0.3 | 0 | 0.3 |
| 1.7 | 0 | 0 | 0 | 0 |
| Total | 54.0 | 53.0 | 58.3 | 435.0 |

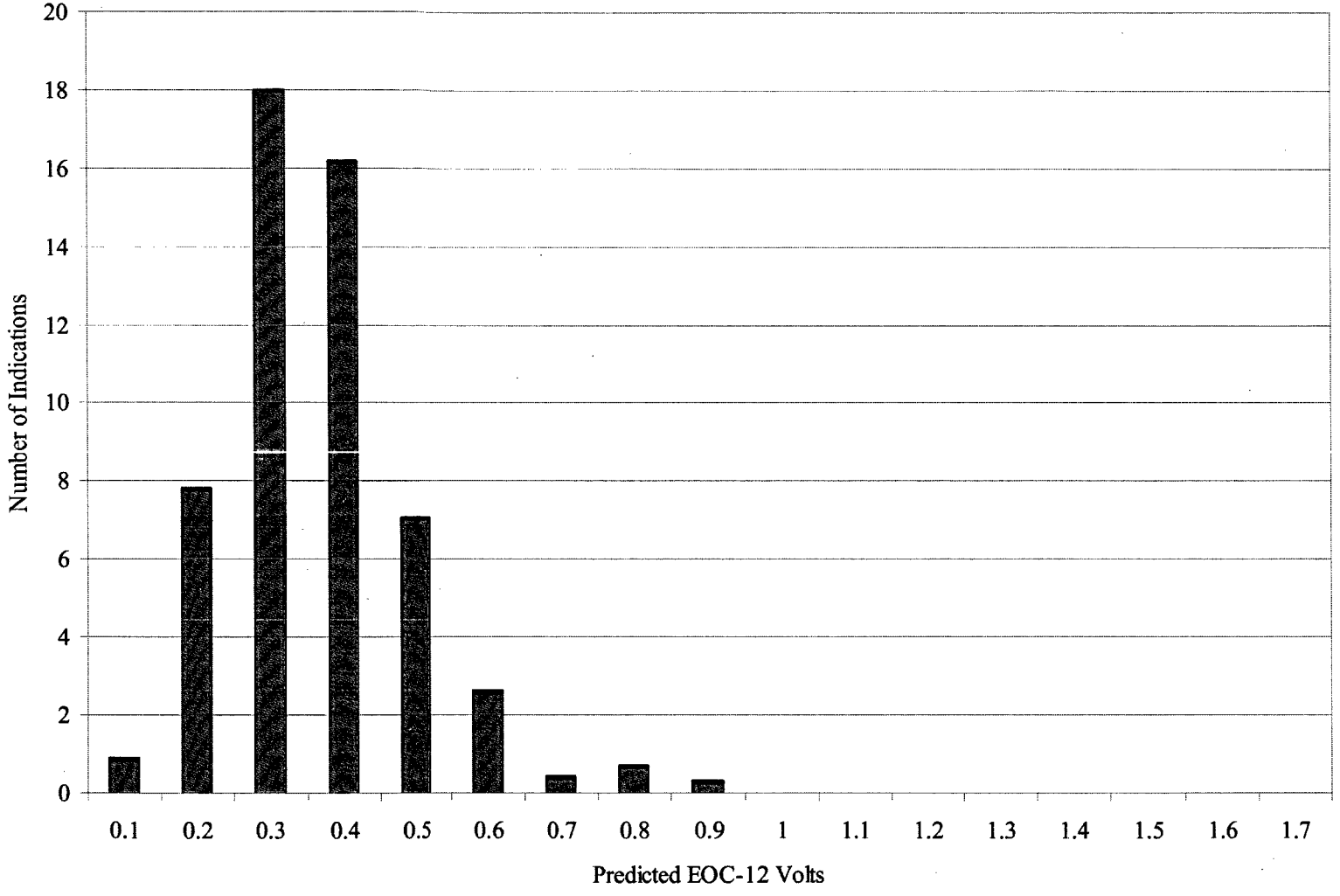


Figure 6-1: Predicted Voltage Distribution, SG 1

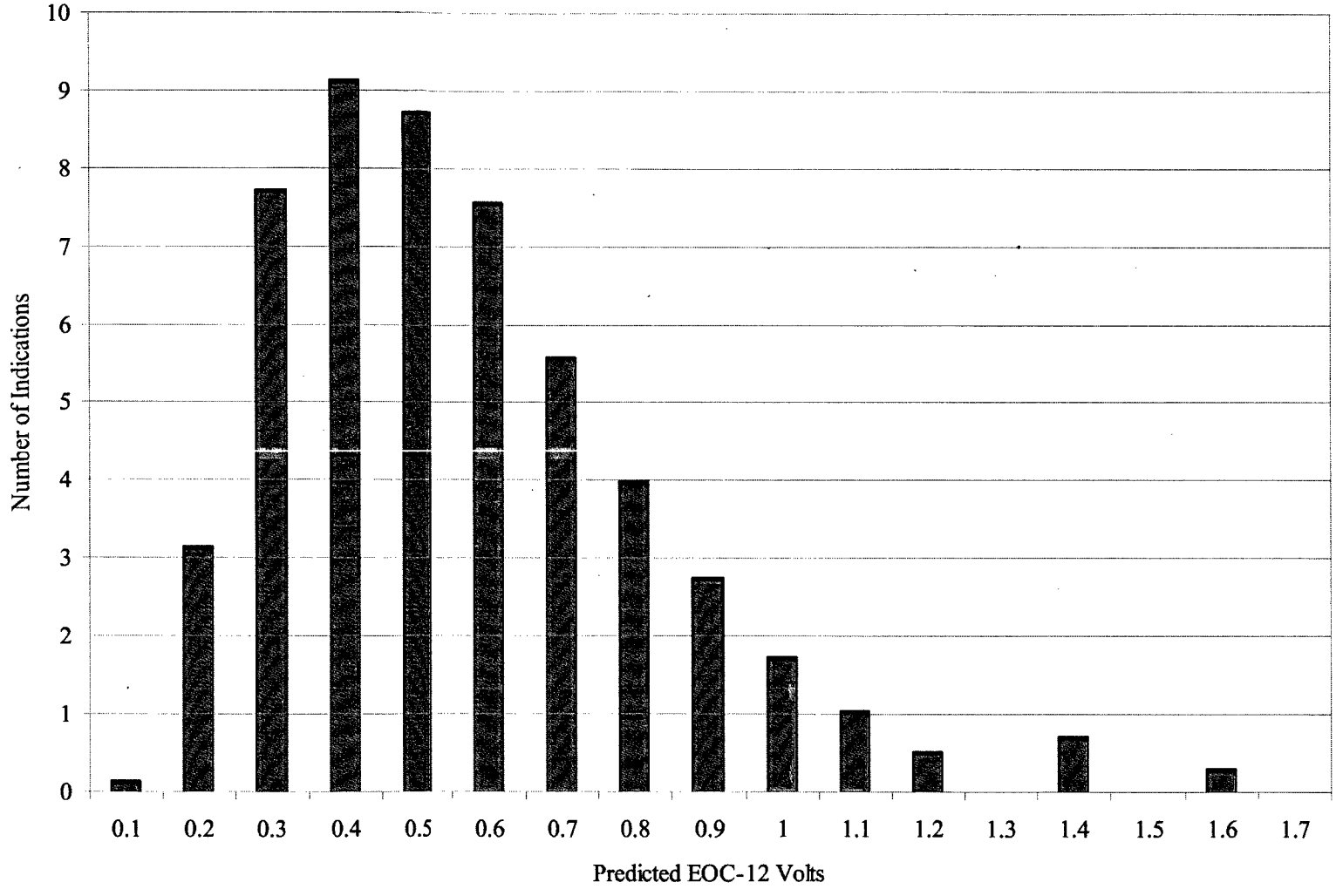


Figure 6-2: Predicted Voltage Distribution, SG 2

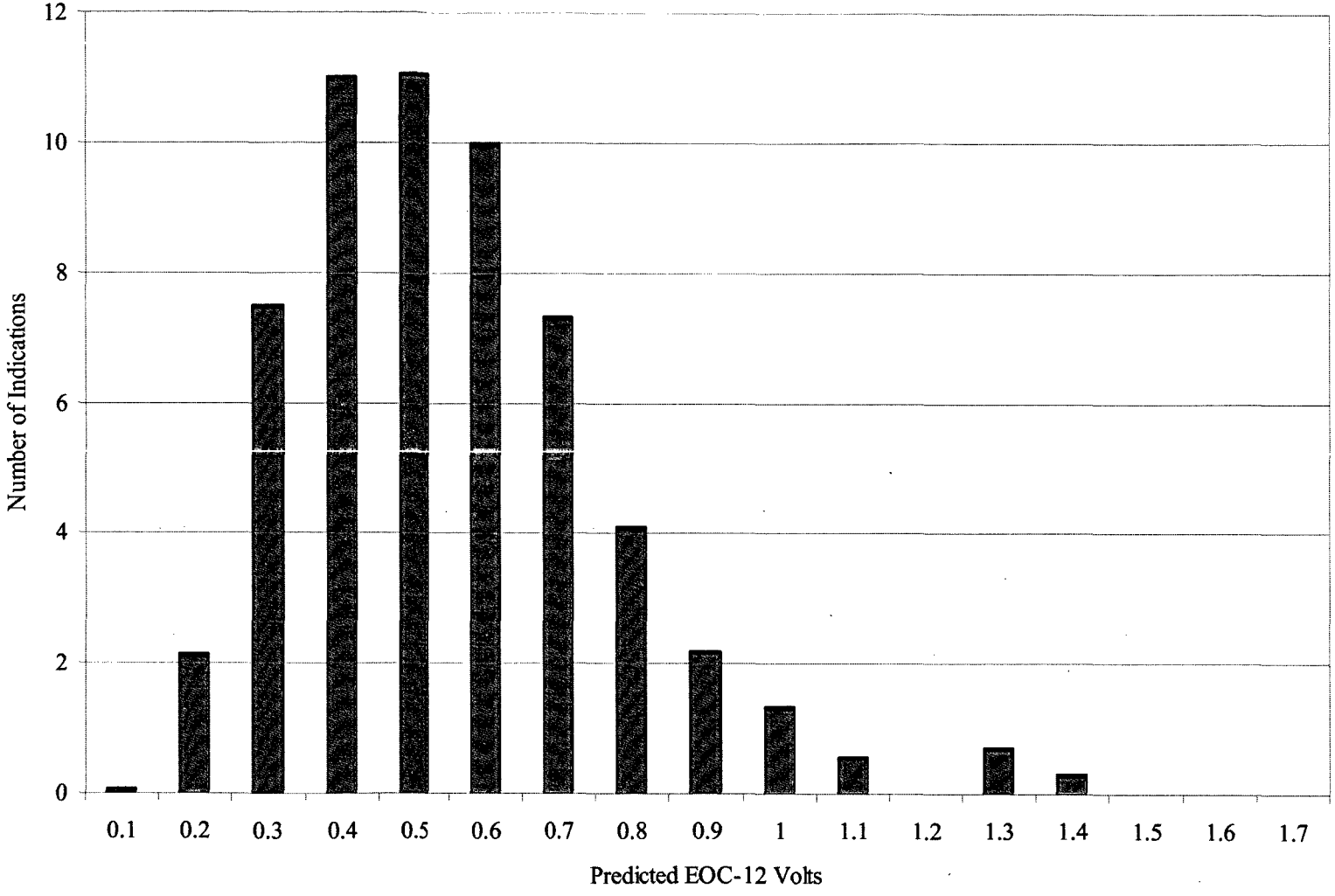


Figure 6-3: Predicted Voltage Distribution, SG 3

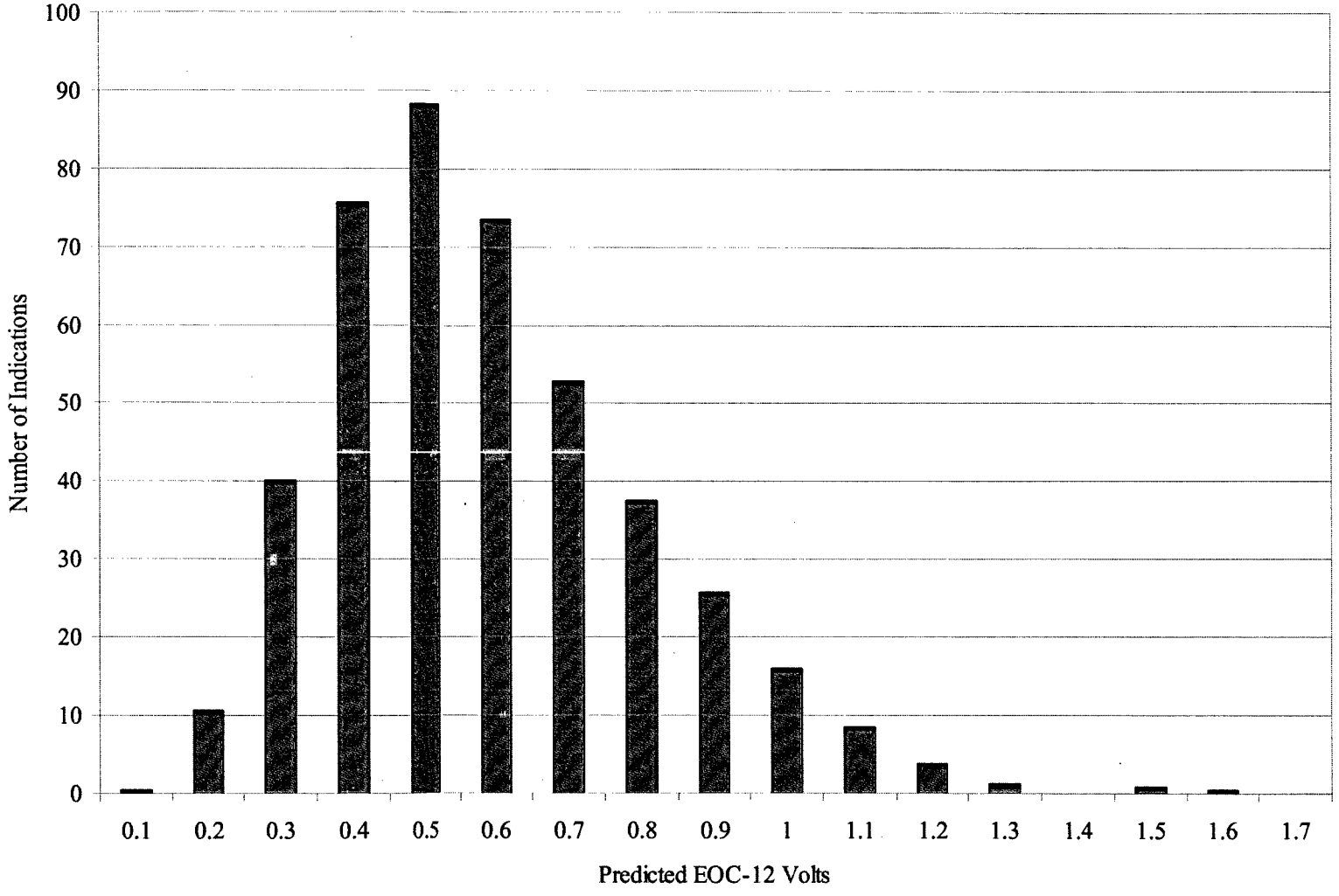


Figure 6-4: Predicted Voltage Distribution, SG 4

## 6.5 PREDICTION OF TUBE LEAK RATES AND BURST PROBABILITIES AT EOC-12

The Monte Carlo analysis results for predicted EOC-12 voltage distributions are shown in Table 6-3. One-quarter-million Monte Carlo trials were performed for each steam generator in this operational assessment. The Cycle 11 bounding growth rate was used for these predictions. The leakage rate is the 95$^{th}$ percentile evaluated at 95% confidence. The burst probability is 95% confidence based on the number of trials.

Table 6-3: EOC-12 Predicted Results

| SG | Number of Monte Carlo Trials | Number of Indications | Maximum Volts* | Burst Probability 95% Confidence | 95/95 SLB Leak Rate (gpm) |
|---|---|---|---|---|---|
| 1 | 250,000 | 54.0 | 0.9 | $1.200 \times 10^{-5}$ | $9.95 \times 10^{-5}$ |
| 2 | 250,000 | 53.0 | 1.6 | $2.520 \times 10^{-5}$ | $3.88 \times 10^{-4}$ |
| 3 | 250,000 | 58.3 | 1.4 | $1.200 \times 10^{-5}$ | $2.09 \times 10^{-4}$ |
| 4 | 250,000 | 435.0 | 1.6 | $4.206 \times 10^{-5}$ | $2.70 \times 10^{-3}$ |

* Voltage where tail is accumulated to 0.3 indications (Reference 3)

## 6.6 COMPARISON WITH ACCEPTANCE CRITERIA

All steam generators are below the burst acceptance criterion of $1.0 \times 10^{-2}$, and the Comanche Peak Unit 1 leakage criterion of 27.79 gpm (Reference 2).

## 7.0 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. E-mail from V. Polizzi to T. Magee, "RE: Basic Questions for the 95-05 Analysis for Comanche Peak 1," October 27, 2005.

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

4. Westinghouse Letter WPT-15949, "TU Electric Company, Comanche Peak Steam Electric Station Unit 1, Steam Generator Alternate Repair Criteria," from J.S. Wyble (Westinghouse) to C.L. Terry (TU Electric Company), November 9, 1998.

5. Westinghouse Report SG-SGDA-04-29, Revision 1, "Comanche Peak Unit - 1 Cycle 11 Voltage-Based Repair Criteria 90-Day Report," August 2004.

6. EPRI Report NP-7480-L, Addendum 6, 2004 Database Update, "Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube Support Plates Database for Alternate Repair Limits," October 2004.

7. Letter from B.W. Sheron, Nuclear Regulatory Commission, to A. Marion, Nuclear Energy Research Institute, February 9, 1996.

8. Letter from A. Marion, Nuclear Energy Research Institute, to B. Sheron, Nuclear Regulatory Commission, "Refining the Leak Rate Sampling Methodology for ODSCC ARC Applications (Generic Letter 95-05)," March 15, 2002.

9. Letter from W. Bateman, Nuclear Regulatory Commission, to A. Marion, Nuclear Energy Research Institute, "Refining the Leak Rate Sampling Methodology for Generic Letter 95-05 Voltage-Based Alternate Repair Criteria Application," March 27, 2002.

10. EPRI Report NP 7480-L, Addendum 5, 2002 Database Update, "Steam Generator Tubing Outside Diameter Stress Corrosion Cracking at Tube Support Plates Database for Alternate repair Limits, " December 2002.

# APPENDIX A

## Indication List - Comanche Peak Unit 1 GL-95-05
## End of Cycle 11 Sorted by EOC-11 Voltage

| Steam Generator 1 | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 25 | 69 | H3 | | 0.45 | 0.34 |
| 26 | 34 | H5 | | 0.43 | 0.42 |
| 39 | 17 | C11 | Yes | 0.39 | DSS |
| 4 | 33 | H7 | | 0.3 | 0.2 |
| 29 | 28 | H3 | | 0.3 | 0.18 |
| 37 | 34 | H5 | | 0.3 | 0.32 |
| 26 | 66 | H3 | | 0.28 | 0.27 |
| 21 | 30 | H3 | | 0.27 | 0.3 |
| 24 | 67 | H5 | | 0.27 | 0.33 |
| 24 | 94 | H3 | | 0.26 | 0.32 |
| 35 | 34 | H5 | | 0.26 | 0.28 |
| 19 | 41 | H3 | | 0.25 | 0.32 |
| 26 | 51 | H3 | | 0.25 | 0.24 |
| 28 | 74 | H3 | | 0.25 | 0.23 |
| 33 | 34 | H5 | | 0.24 | 0.32 |
| 26 | 69 | H3 | | 0.23 | 0.26 |
| 7 | 39 | H3 | | 0.22 | 0.3 |
| 18 | 99 | H7 | | 0.22 | 0.26 |
| 27 | 28 | H3 | | 0.21 | 0.19 |
| 27 | 65 | H5 | | 0.21 | 0.17 |
| 44 | 52 | H10 | | 0.21 | 0.3 |
| 22 | 35 | H5 | | 0.2 | 0.2 |
| 26 | 68 | H5 | | 0.19 | 0.19 |
| 18 | 94 | H3 | | 0.18 | 0.17 |
| 23 | 36 | H5 | | 0.17 | 0.25 |
| 26 | 65 | H5 | | 0.17 | 0.16 |
| 31 | 75 | H3 | | 0.17 | 0.21 |
| 15 | 17 | H3 | | 0.16 | 0.15 |
| 30 | 63 | H3 | | 0.16 | 0.15 |
| 15 | 86 | H3 | | 0.15 | 0.12 |
| 32 | 64 | H3 | | 0.13 | 0.14 |
| 33 | 60 | H3 | | 0.12 | 0.14 |
| 28 | 34 | H5 | | 0.08 | 0.14 |

(1) All indications greater than or equal to 1 volt at EOC-11 were subject to a + Point inspection. All DSI indications greater than 1 volt, confirmed by + Point inspection, were repaired by plugging.

(2) Indications without an EOC-10 Volts value were not used in the determination of growth rate.

DSS = Distorted Support Signal. Doesn't meet calling criteria for a DSI.

| Steam Generator 2 | | | | | |
|---|---|---|---|---|---|
| **Row** | **Col** | **Elevation** | **Plugged[1]** | **EOC-11 Volts** | **EOC-10 Volts[2]** |
| 26 | 65 | H5 | Yes | 1.26 | 1.18 |
| 26 | 64 | H3 | | 0.95 | 0.33 |
| 26 | 65 | H3 | Yes | 0.88 | 0.8 |
| 26 | 52 | H3 | | 0.79 | 0.68 |
| 26 | 46 | H3 | | 0.77 | 0.75 |
| 27 | 70 | H5 | | 0.65 | 0.52 |
| 27 | 81 | H5 | | 0.62 | 0.48 |
| 31 | 62 | H3 | | 0.62 | 0.51 |
| 21 | 87 | H3 | | 0.54 | 0.54 |
| 28 | 66 | H3 | | 0.51 | 0.49 |
| 29 | 43 | H3 | | 0.5 | 0.63 |
| 34 | 82 | H5 | | 0.47 | 0.12 |
| 28 | 86 | H3 | | 0.44 | 0.3 |
| 28 | 87 | H3 | | 0.44 | 0.38 |
| 28 | 89 | H3 | | 0.44 | 0.43 |
| 29 | 64 | H3 | | 0.44 | 0.4 |
| 27 | 48 | H3 | | 0.42 | 0.3 |
| 32 | 70 | H3 | | 0.4 | 0.35 |
| 49 | 46 | C5 | | 0.38 | DSS |
| 24 | 90 | H3 | | 0.34 | 0.4 |
| 28 | 44 | H3 | | 0.33 | 0.32 |
| 23 | 86 | H3 | | 0.29 | 0.26 |
| 25 | 69 | H5 | | 0.28 | 0.25 |
| 29 | 65 | H3 | | 0.28 | 0.21 |
| 19 | 81 | H5 | | 0.27 | 0.2 |
| 27 | 82 | H5 | | 0.26 | 0.18 |
| 36 | 81 | H5 | | 0.26 | 0.21 |
| 30 | 70 | H5 | | 0.22 | 0.22 |
| 23 | 24 | H3 | | 0.2 | 0.25 |
| 24 | 92 | H3 | | 0.2 | 0.35 |
| 26 | 91 | H3 | | 0.2 | 0.32 |
| 34 | 17 | H7 | | 0.16 | 0.19 |
| 29 | 80 | H5 | | 0.15 | 0.12 |

(1) All indications greater than or equal to 1 volt at EOC-11 were subject to a + Point inspection. All DSI indications greater than 1 volt, confirmed by + Point inspection, were repaired by plugging.

(2) Indications without an EOC-10 Volts value were not used in the determination of growth rate.

DSS = Distorted Support Signal. Doesn't meet calling criteria for a DSI.

| Steam Generator 3 | | | | | |
|---|---|---|---|---|---|
| **Row** | **Col** | **Elevation** | **Plugged[1]** | **EOC-11 Volts** | **EOC-10 Volts[2]** |
| 5 | 83 | H1 | | 0.94 | 0.63 |
| 32 | 51 | H3 | | 0.81 | 0.63 |
| 17 | 27 | H3 | | 0.66 | 0.44 |
| 23 | 37 | H3 | | 0.62 | 0.54 |
| 25 | 71 | H3 | | 0.6 | 0.62 |
| 24 | 62 | H5 | | 0.54 | 0.85 |
| 24 | 64 | H3 | | 0.54 | 0.49 |
| 26 | 62 | H3 | | 0.53 | 0.55 |
| 27 | 63 | H3 | | 0.51 | 0.61 |
| 34 | 93 | H8 | | 0.51 | 0.5 |
| 26 | 65 | H3 | | 0.48 | 0.41 |
| 26 | 25 | H3 | | 0.47 | 0.68 |
| 4 | 39 | H7 | | 0.45 | 0.44 |
| 49 | 44 | C7 | | 0.45 | DSS |
| 26 | 68 | H3 | | 0.44 | 0.42 |
| 24 | 66 | H3 | | 0.42 | 0.42 |
| 25 | 24 | H3 | | 0.42 | 0.31 |
| 23 | 87 | H5 | | 0.37 | 0.25 |
| 25 | 62 | H3 | | 0.37 | 0.42 |
| 31 | 29 | H3 | | 0.37 | 0.49 |
| 23 | 87 | H3 | | 0.36 | 0.26 |
| 26 | 74 | H3 | | 0.36 | 0.24 |
| 24 | 28 | H3 | | 0.35 | 0.29 |
| 2 | 1 | H5 | | 0.3 | 0.27 |
| 28 | 22 | H3 | | 0.3 | 0.17 |
| 18 | 25 | H3 | | 0.29 | 0.17 |
| 21 | 87 | H5 | | 0.28 | 0.26 |
| 27 | 43 | H3 | | 0.28 | 0.22 |
| 22 | 28 | H3 | | 0.27 | 0.22 |
| 39 | 63 | H8 | | 0.26 | 0.23 |
| 22 | 81 | H3 | | 0.25 | 0.15 |
| 20 | 88 | H3 | | 0.21 | 0.19 |
| 10 | 19 | H3 | | 0.2 | 0.21 |
| 18 | 28 | H3 | | 0.2 | 0.2 |
| 2 | 2 | H5 | | 0.14 | 0.17 |

(1) All indications greater than or equal to 1 volt at EOC-11 were subject to a + Point inspection. All DSI indications greater than 1 volt, confirmed by + Point inspection, were repaired by plugging.

(2) Indications without an EOC-10 Volts value were not used in the determination of growth rate.

DSS = Distorted Support Signal. Doesn't meet calling criteria for a DSI.

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 36 | 77 | H5 | | 0.92 | 0.77 |
| 37 | 38 | H3 | | 0.92 | 0.9 |
| 26 | 43 | H3 | | 0.91 | 0.72 |
| 37 | 37 | H3 | | 0.89 | 0.71 |
| 27 | 54 | H3 | | 0.88 | 0.66 |
| 30 | 81 | H5 | | 0.87 | 0.71 |
| 26 | 84 | H3 | | 0.86 | 0.66 |
| 28 | 52 | H3 | | 0.85 | 0.72 |
| 25 | 52 | H3 | | 0.84 | 0.71 |
| 28 | 36 | H3 | | 0.84 | 0.7 |
| 38 | 35 | H3 | | 0.84 | 0.7 |
| 31 | 80 | H5 | | 0.82 | 0.67 |
| 38 | 36 | H3 | | 0.82 | 0.88 |
| 24 | 80 | H3 | | 0.81 | 0.75 |
| 35 | 81 | H5 | | 0.81 | 0.73 |
| 26 | 47 | H3 | | 0.8 | 0.65 |
| 36 | 73 | H5 | | 0.8 | 0.68 |
| 35 | 85 | H3 | | 0.78 | 0.82 |
| 28 | 44 | H5 | | 0.76 | 0.45 |
| 28 | 48 | H3 | | 0.76 | 0.62 |
| 37 | 75 | H5 | | 0.76 | 0.62 |
| 25 | 45 | H3 | | 0.74 | 0.78 |
| 27 | 41 | H5 | | 0.74 | 0.58 |
| 37 | 84 | H3 | | 0.73 | 0.67 |
| 38 | 68 | H5 | | 0.73 | 0.85 |
| 20 | 43 | H3 | | 0.72 | 0.5 |
| 25 | 70 | H5 | | 0.72 | 0.77 |
| 42 | 61 | H3 | | 0.72 | 0.72 |
| 27 | 66 | H3 | | 0.71 | 0.7 |
| 34 | 77 | H3 | | 0.71 | 0.7 |
| 28 | 34 | H3 | | 0.7 | 0.49 |
| 25 | 47 | H3 | | 0.68 | 0.48 |
| 28 | 44 | H3 | | 0.68 | 0.62 |
| 35 | 61 | H3 | | 0.68 | 0.72 |
| 35 | 77 | H5 | | 0.68 | 0.51 |
| 25 | 70 | H3 | | 0.67 | 0.6 |
| 38 | 81 | H5 | | 0.67 | 0.48 |
| 17 | 20 | H3 | | 0.66 | 0.4 |
| 26 | 42 | H3 | | 0.65 | 0.28 |
| 27 | 52 | H3 | | 0.65 | 0.68 |
| 30 | 39 | H5 | | 0.65 | 0.56 |
| 35 | 82 | H5 | | 0.65 | 0.51 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 26 | 46 | H5 | | 0.64 | 0.55 |
| 31 | 50 | H3 | | 0.64 | 0.74 |
| 26 | 79 | H3 | | 0.63 | 0.57 |
| 27 | 78 | H3 | | 0.63 | 0.72 |
| 30 | 54 | H3 | | 0.63 | 0.5 |
| 41 | 39 | H5 | | 0.63 | 0.68 |
| 25 | 47 | H5 | | 0.61 | 0.54 |
| 26 | 79 | H5 | | 0.61 | 0.51 |
| 27 | 49 | H5 | | 0.61 | 0.58 |
| 28 | 46 | H3 | | 0.61 | 0.64 |
| 30 | 61 | H5 | | 0.61 | 0.43 |
| 32 | 40 | H5 | | 0.61 | 0.45 |
| 24 | 45 | H3 | | 0.59 | 0.48 |
| 30 | 50 | H5 | | 0.59 | 0.42 |
| 30 | 82 | H5 | | 0.59 | 0.52 |
| 32 | 84 | H3 | | 0.59 | 0.27 |
| 30 | 47 | H3 | | 0.58 | 0.58 |
| 32 | 75 | H3 | | 0.58 | 0.54 |
| 24 | 36 | H3 | | 0.57 | 0.54 |
| 26 | 62 | H3 | | 0.57 | 0.59 |
| 27 | 48 | H3 | | 0.57 | 0.6 |
| 27 | 48 | H5 | | 0.57 | 0.42 |
| 27 | 80 | H3 | | 0.57 | 0.48 |
| 38 | 39 | H3 | | 0.57 | 0.68 |
| 25 | 72 | H3 | | 0.56 | 0.54 |
| 26 | 47 | H5 | | 0.56 | 0.44 |
| 33 | 64 | H5 | | 0.56 | 0.44 |
| 27 | 43 | H3 | | 0.55 | 0.5 |
| 29 | 50 | H5 | | 0.55 | 0.42 |
| 29 | 81 | H5 | | 0.55 | 0.45 |
| 37 | 38 | H5 | | 0.55 | 0.48 |
| 27 | 56 | H5 | | 0.54 | 0.41 |
| 29 | 47 | H3 | | 0.54 | 0.44 |
| 26 | 49 | H5 | | 0.53 | 0.56 |
| 29 | 42 | H3 | | 0.53 | 0.38 |
| 27 | 50 | H5 | | 0.52 | 0.57 |
| 28 | 49 | H3 | | 0.52 | 0.47 |
| 31 | 59 | H5 | | 0.52 | 0.6 |
| 38 | 78 | H3 | | 0.52 | 0.55 |
| 27 | 42 | H3 | | 0.51 | 0.45 |
| 26 | 75 | H5 | | 0.5 | 0.57 |
| 27 | 47 | H5 | | 0.5 | 0.49 |
| 29 | 32 | H7 | | 0.5 | 0.55 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 29 | 47 | H5 | | 0.5 | 0.5 |
| 29 | 83 | H3 | | 0.5 | 0.68 |
| 31 | 67 | H5 | | 0.5 | 0.47 |
| 38 | 78 | H5 | | 0.5 | 0.27 |
| 22 | 81 | H5 | | 0.49 | 0.3 |
| 24 | 81 | H5 | | 0.49 | 0.45 |
| 26 | 51 | H3 | | 0.49 | 0.43 |
| 12 | 15 | H3 | | 0.48 | 0.44 |
| 22 | 87 | H3 | | 0.48 | 0.4 |
| 27 | 36 | H3 | | 0.48 | 0.4 |
| 27 | 74 | H3 | | 0.48 | 0.33 |
| 32 | 38 | H3 | | 0.48 | 0.36 |
| 33 | 30 | H7 | | 0.48 | 0.43 |
| 34 | 77 | H5 | | 0.48 | 0.54 |
| 20 | 41 | H3 | | 0.47 | 0.3 |
| 29 | 80 | H3 | | 0.47 | 0.43 |
| 32 | 37 | H5 | | 0.47 | 0.44 |
| 32 | 38 | H7 | | 0.47 | 0.16 |
| 35 | 50 | H3 | | 0.47 | 0.39 |
| 25 | 34 | H3 | | 0.46 | 0.55 |
| 26 | 41 | H5 | | 0.46 | 0.33 |
| 27 | 25 | H3 | | 0.46 | 0.43 |
| 29 | 46 | H3 | | 0.46 | 0.44 |
| 36 | 36 | H3 | | 0.46 | 0.34 |
| 24 | 34 | H3 | | 0.45 | 0.39 |
| 26 | 81 | H5 | | 0.45 | 0.43 |
| 27 | 81 | H5 | | 0.45 | 0.45 |
| 28 | 54 | H3 | | 0.45 | 0.21 |
| 30 | 78 | H5 | | 0.45 | 0.47 |
| 31 | 49 | H3 | | 0.45 | 0.46 |
| 14 | 99 | H3 | | 0.44 | 0.43 |
| 20 | 27 | H5 | | 0.44 | 0.37 |
| 26 | 85 | H3 | | 0.44 | 0.4 |
| 28 | 64 | H3 | | 0.44 | 0.46 |
| 29 | 87 | H3 | | 0.44 | 0.38 |
| 33 | 79 | H5 | | 0.44 | 0.43 |
| 22 | 85 | H3 | | 0.43 | 0.4 |
| 26 | 36 | H3 | | 0.43 | 0.45 |
| 26 | 67 | H3 | | 0.43 | 0.39 |
| 26 | 75 | H7 | | 0.43 | 0.44 |
| 26 | 35 | H3 | | 0.42 | 0.37 |
| 35 | 72 | H3 | | 0.42 | 0.37 |
| 35 | 85 | H7 | | 0.42 | 0.5 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 25 | 42 | H3 | | 0.41 | 0.3 |
| 26 | 46 | H3 | | 0.41 | 0.43 |
| 27 | 75 | H5 | | 0.41 | 0.46 |
| 33 | 75 | H5 | | 0.41 | 0.32 |
| 36 | 75 | H5 | | 0.41 | 0.31 |
| 24 | 77 | H3 | | 0.4 | 0.37 |
| 25 | 68 | H3 | | 0.4 | 0.4 |
| 30 | 32 | H7 | | 0.4 | 0.34 |
| 38 | 35 | H5 | | 0.4 | 0.35 |
| 41 | 76 | H5 | | 0.4 | 0.38 |
| 17 | 20 | H5 | | 0.39 | 0.39 |
| 26 | 91 | H3 | | 0.39 | 0.36 |
| 31 | 87 | H3 | | 0.39 | 0.31 |
| 32 | 76 | H5 | | 0.39 | 0.4 |
| 34 | 81 | H5 | | 0.39 | 0.34 |
| 49 | 68 | H9 | | 0.39 | 0.36 |
| 28 | 39 | H5 | | 0.38 | 0.38 |
| 21 | 85 | H3 | | 0.37 | 0.18 |
| 27 | 69 | H5 | | 0.37 | 0.35 |
| 30 | 59 | H3 | | 0.37 | 0.35 |
| 30 | 85 | H3 | | 0.37 | 0.35 |
| 31 | 35 | H3 | | 0.37 | 0.54 |
| 31 | 37 | H3 | | 0.37 | 0.36 |
| 31 | 41 | H3 | | 0.37 | 0.3 |
| 35 | 79 | H3 | | 0.37 | 0.3 |
| 7 | 34 | C10 | | 0.36 | DSS |
| 22 | 81 | H3 | | 0.36 | 0.24 |
| 27 | 34 | H3 | | 0.36 | 0.35 |
| 28 | 76 | H5 | | 0.36 | 0.3 |
| 29 | 41 | H5 | | 0.36 | 0.2 |
| 30 | 77 | H5 | | 0.36 | 0.4 |
| 31 | 50 | H5 | | 0.36 | 0.29 |
| 34 | 34 | H5 | | 0.36 | 0.3 |
| 21 | 26 | H5 | | 0.35 | 0.34 |
| 26 | 72 | H3 | | 0.35 | 0.32 |
| 27 | 36 | H7 | | 0.35 | 0.3 |
| 27 | 53 | H7 | | 0.35 | 0.55 |
| 33 | 25 | H3 | | 0.35 | 0.32 |
| 42 | 76 | H5 | | 0.35 | 0.27 |
| 25 | 69 | H5 | | 0.34 | 0.26 |
| 26 | 41 | H3 | | 0.34 | 0.26 |
| 26 | 45 | H3 | | 0.34 | 0.28 |
| 26 | 48 | H5 | | 0.34 | 0.3 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 26 | 50 | H5 | | 0.34 | 0.22 |
| 26 | 66 | H5 | | 0.34 | 0.31 |
| 28 | 47 | H5 | | 0.34 | 0.32 |
| 29 | 48 | H5 | | 0.34 | 0.46 |
| 29 | 53 | H3 | | 0.34 | 0.29 |
| 29 | 78 | H3 | | 0.34 | 0.33 |
| 32 | 80 | H5 | | 0.34 | 0.4 |
| 37 | 35 | H3 | | 0.34 | 0.25 |
| 42 | 44 | H3 | | 0.34 | 0.23 |
| 25 | 31 | H3 | | 0.33 | 0.35 |
| 25 | 43 | H7 | | 0.33 | 0.35 |
| 26 | 70 | H3 | | 0.33 | 0.23 |
| 27 | 42 | H5 | | 0.33 | 0.36 |
| 31 | 28 | H3 | | 0.33 | 0.4 |
| 31 | 34 | H3 | | 0.33 | 0.21 |
| 38 | 54 | H3 | | 0.33 | 0.23 |
| 26 | 81 | H3 | | 0.32 | 0.25 |
| 28 | 49 | H5 | | 0.32 | 0.36 |
| 30 | 62 | H3 | | 0.32 | 0.41 |
| 31 | 78 | H5 | | 0.32 | 0.28 |
| 35 | 35 | H7 | | 0.32 | 0.28 |
| 23 | 87 | H3 | | 0.31 | 0.22 |
| 24 | 45 | H5 | | 0.31 | 0.34 |
| 26 | 45 | H5 | | 0.31 | 0.22 |
| 29 | 30 | H3 | | 0.31 | 0.33 |
| 30 | 28 | H3 | | 0.31 | 0.29 |
| 30 | 49 | H5 | | 0.31 | 0.32 |
| 33 | 55 | H5 | | 0.31 | 0.22 |
| 36 | 41 | H3 | | 0.31 | 0.25 |
| 37 | 36 | H5 | | 0.31 | 0.31 |
| 23 | 31 | H5 | | 0.3 | 0.35 |
| 29 | 28 | H5 | | 0.29 | 0.14 |
| 34 | 59 | H3 | | 0.29 | 0.21 |
| 35 | 82 | H3 | | 0.29 | 0.34 |
| 27 | 73 | H7 | | 0.28 | 0.23 |
| 30 | 82 | H3 | | 0.28 | 0.6 |
| 36 | 30 | H5 | | 0.28 | 0.24 |
| 37 | 36 | H3 | | 0.28 | 0.22 |
| 38 | 37 | H7 | | 0.28 | 0.3 |
| 28 | 36 | H7 | | 0.27 | 0.27 |
| 30 | 26 | H3 | | 0.27 | 0.23 |
| 34 | 76 | H5 | | 0.27 | 0.25 |
| 38 | 60 | H3 | | 0.27 | 0.21 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| Row | Col | Elevation | Plugged[1] | EOC-11 Volts | EOC-10 Volts[2] |
| 38 | 62 | H3 | | 0.27 | 0.27 |
| 29 | 28 | H3 | | 0.26 | 0.19 |
| 29 | 36 | H3 | | 0.26 | 0.33 |
| 31 | 77 | H5 | | 0.26 | 0.23 |
| 43 | 50 | H5 | | 0.26 | 0.33 |
| 19 | 93 | H7 | | 0.25 | 0.15 |
| 22 | 39 | H3 | | 0.25 | 0.24 |
| 24 | 48 | H3 | | 0.25 | 0.18 |
| 31 | 62 | H5 | | 0.25 | 0.2 |
| 22 | 36 | H3 | | 0.24 | 0.28 |
| 23 | 42 | H3 | | 0.24 | 0.15 |
| 25 | 34 | H7 | | 0.24 | 0.19 |
| 25 | 47 | H8 | | 0.24 | 0.24 |
| 26 | 69 | H5 | | 0.24 | 0.23 |
| 32 | 75 | H5 | | 0.24 | 0.24 |
| 34 | 42 | H5 | | 0.24 | 0.24 |
| 37 | 78 | H5 | | 0.24 | 0.26 |
| 40 | 76 | H5 | | 0.24 | 0.27 |
| 24 | 86 | H7 | | 0.23 | 0.18 |
| 27 | 50 | H3 | | 0.23 | 0.26 |
| 28 | 41 | H5 | | 0.23 | 0.21 |
| 31 | 41 | H5 | | 0.23 | 0.27 |
| 16 | 93 | H3 | | 0.22 | 0.18 |
| 18 | 83 | H3 | | 0.22 | 0.2 |
| 20 | 29 | H5 | | 0.22 | 0.24 |
| 29 | 24 | H5 | | 0.22 | 0.19 |
| 2 | 5 | H5 | | 0.21 | 0.1 |
| 25 | 85 | H3 | | 0.21 | 0.24 |
| 27 | 47 | H3 | | 0.21 | 0.2 |
| 31 | 37 | H7 | | 0.21 | 0.18 |
| 31 | 55 | H5 | | 0.21 | 0.17 |
| 24 | 84 | H3 | | 0.2 | 0.14 |
| 28 | 84 | H3 | | 0.2 | 0.21 |
| 34 | 66 | H5 | | 0.2 | 0.21 |
| 40 | 42 | H5 | | 0.2 | 0.19 |
| 26 | 35 | H5 | | 0.19 | 0.21 |
| 20 | 17 | H11 | | 0.18 | 0.19 |
| 27 | 40 | H8 | | 0.18 | 0.16 |
| 23 | 34 | H3 | | 0.16 | 0.19 |
| 29 | 93 | H5 | | 0.16 | 0.17 |
| 32 | 26 | H3 | | 0.15 | 0.13 |
| 32 | 80 | H3 | | 0.15 | 0.18 |
| 16 | 93 | H5 | | 0.14 | 0.16 |

| Steam Generator 4[3] | | | | | |
|---|---|---|---|---|---|
| **Row** | **Col** | **Elevation** | **Plugged[1]** | **EOC-11 Volts** | **EOC-10 Volts[2]** |
| 18 | 89 | H3 | | 0.14 | 0.18 |
| 21 | 91 | H3 | | 0.13 | 0.15 |
| 23 | 86 | H5 | | 0.11 | 0.14 |

(1) All indications greater than or equal to 1 volt at EOC-11 were subject to a + Point inspection. All DSI indications greater than 1 volt, confirmed by + Point inspection, were repaired by plugging.

(2) Indications without an EOC-10 Volts value were not used in the determination of growth rate.
DSS = Distorted Support Signal. Doesn't meet calling criteria for a DSI.

(3) This summary does not include the SG4 H11 intersection of Row 1 Column 100. This intersection did not have a DSI call by Bobbin coil, but it did have a 0.29 Volt SAI call by MRPC. From a linear regression of DSI voltages with confirmed MRPC voltages it is estimated that this intersection had a 0.60 volt DSI. This intersection did not have a reportable DSI or SAI call at the EOC-10 inspection