J.M. Farley Unit 1

Alternate Plugging Criteria

Return to Power Report

May 1997

Westinghouse Electric Corporation
Nuclear Services Division
Madison, PA 15663

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1.0 Introduction

This report provides the J.M. Farley Unit 1 steam generator tube Eddy Current (EC) inspection results at the end of Cycle 14 together with Steam Line Break (SLB) leak rate and tube burst probability analysis results calculated using the measured voltage data, to implement a 2.0 volt Alternate Plugging Criteria (APC). The results based on the actual measured EOC-14 voltage distributions are compared with the projected indication distributions based on the EOC-10 data. Preliminary (pending final repair list) projected EOC-15 SLB leak rate and burst probability are also included in this report. The methodology used in these evaluations is in accordance with previously submitted Westinghouse methodology report (Reference 1).

2.0 Summary and Conclusions

SLB leak rate and tube burst probability analyses were performed for all three steam generators (SG) based on their actual measured EOC-14 voltage distributions and the results compared with the projections performed during the last outage. The total number of indications found at tube support plates (TSPs) during the current inspections are significantly less than those projected at the beginning of the cycle using a POD of 0.6. Actual peak voltages, and leakage rates and tube burst probabilities calculated using the actual measured voltages are also lower than projected, except for peak voltage and tube burst probability for SG-C as described below.

For the actual EOC-14 bobbin voltage distributions, the largest SLB leak rate is calculated for SG-C and its magnitude is 7.6 gpm; the corresponding burst probability is 5.2×10^{-3}. These values are lower than the allowable Cycle 14 SLB leakage limit of 11.4 gpm and the NRC reporting guideline of 10^{-2} for the conditional tube burst probability. However, the burst probability is modestly higher than that projected and the difference is caused by detection of a 13.7 volts indication which is significantly above the predicted peak voltage (7.6 volts).

SLB leak rate and tube probability projections were also performed for EOC-15 conditions, and all results except for SG-C leak rate are within the allowable limits. Based on NRC mandated constant POD of 0.6, the EOC-15 SLB leak rate for SG-C is projected to be 15.4 gpm, which exceeds the current licensed limit of 11.4 gpm.

However, a license amendment to revise the acceptable SLB leakage limit to 19 gpm is pending and it envelopes the projected leak rate. The limiting burst probability, also calculated for SG-C, is 9.6×10^{-3} which is below the 10^{-2} allowable limit. If a voltage-dependent POD based on POPCD is applied, the SLB burst probability is reduced to 4.4×10^{-3}, and the leak rate is reduced to 9.6 gpm which is within the current limit of 11.4 gpm.

A total of 3075 indications were found in the EOC-14 inspection of which 564 were inspected with a Rotating Pancake Coil (RPC) probe (including a minimum of 20 % of hot leg indications between 1 and 2 volts and all hot leg indications above 2 volts in SGs A and B and above 1.5 volts in SG-C), and 402 were confirmed as flaws. The RPC confirmed indications included 271 above 1.0 volt. The largest number of bobbin indications, 1140 indications, were found in SG-C, 319 of those were inspected by RPC, and 208 were confirmed as flaws. One hundred and seven indications were found above 2 volts in all SGs combined, of which 46 occurred in SG-C, and 34 of them were confirmed by RPC. No volumetric-type RPC signals were found.

A large number of tubes in SGs A and C previously plugged in accordance with prior repair criteria were deplugged, inspected and repaired in accordance with APC by installing sleeves or replugged. No deplugged tubes were returned to service in SG-B. Only 7 indications, all below the APC repair limit, were left unrepaired in tubes returned to service in SGs A and C.

The tube with the largest indication found in the current inspections (13.7 volts, R2C85 in SG-C) is scheduled for removal and detailed examination.

3.0 EOC-14 Inspection Results and Voltage Growth Rates

3.1 EOC-14 Inspection Results

In accordance with the APC guidance provided by the NRC Generic Letter 95-05 (Reference 1), the end of Cycle 14 inspection of the Farley Unit 1 steam generators (SG) consisted of a complete, 100% EC bobbin probe, full length examination of the tube bundles in all three SGs. A 0.720 inch diameter probe was used for all hot and cold leg TSPs where APC was applied. Subsequently, RPC examination was performed for a minimum of 20 percent of the hot leg indications with an amplitude between 1 and 2 volts, all hot leg indications with an amplitude 2 volts and above, and all cold leg indications. One hundred and seven indications had a bobbin voltage above 2 volts; 86 were confirmed as flaws and 88 were removed from service due to tube repairs.

In addition, an augmented RPC inspection was performed consistent with the NRC requirements. All dented intersections with a bobbin voltage greater than 5 volts and a minimum of 20 percent of the dented intersections with a bobbin voltage between 2.5 and 5 volts were inspected with RPC. Large bobbin residual artifact signals were also RPC inspected. There were no RPC circumferential indications at the TSPs, no indications extending outside the TSPs, and no RPC indications with potential ID phase angles.

A summary of EC indications for all three steam generators is shown on Table 1, which tabulates the number of field bobbin indications, the number of those indications that were RPC inspected, the number of RPC confirmed indications, and the number of indications removed from service due to tube repairs. The indications that remain active for Cycle 15 operation is the difference between the observed and the ones removed from service. A large number of tubes in SGs A and C previously plugged in accordance with prior repair criteria were deplugged, inspected and repaired in accordance with APC by installing sleeves or replugged. No deplugged tubes were returned to service in SG-B. Only 7 indications, all below the APC repair limit, were left unrepaired in tubes returned to service in SGs A and C.

A review of Table 1 indicates that more indications (a quantity of 973, with 561 indications above 1.0 volt) would be returned to service in SG-C, more than the other SGs, thereby it potentially will be the limiting SG at EOC-15. It is noted that SG-C had the largest indication (13.7 volts) found in the EOC-14 inspection. Figure 1 shows the actual bobbin voltage distribution from the EOC-14 EC inspection; Figure 2 shows the population distribution of those EOC-14 indications removed from service due to tube repairs; Figure 3 shows the indications which could be returned to service for Cycle 14, per the preliminary tube repair list. Of the 425 indications to be removed from service, 88 indications exceeding 2 volts are repaired due to ODSCC at TSPs. The rest of the indications are in tubes plugged for degradation mechanisms other than ODSCC at TSPs .

3.2 Voltage Growth Rates

Table 2 shows the cumulative probability distribution function for growth rate of each Farley Unit 1 steam generator during the last 2 operating periods (Cycles 13 and 14). The growth rates are presented on an EFPY basis to account for the difference in the length of the two operating periods. Figure 4 provides a comparison of the composite voltage growth from all three steam generators for the last four operating periods. For Cycle 14 operation, SG-C has a larger average voltage growth among the three steam generators, and it also has the indication with the largest voltage growth. The composite growth rates from all SGs for Cycle 14 shown in Figure 4 appear to be higher than those for the two prior operating periods.

In Farley Unit-2, tubes deplugged and returned to service at EOC-10 had a significantly higher growth rate during Cycle 11 than the tubes active during Cycle 10. Therefore, it was recommended in Reference 5 that, for ARC projections following return of deplugged tubes to service, an increased growth allowance be made for the indications in the recovered tubes. If plant-specific historical growth data for deplugged tubes are not available from prior cycles, it was suggested that Farley Unit-2 data be used. Accordingly, a composite growth distribution was used for Cycle 15 projections and it was obtained by combining the Cycle 14 growth distribution with the Farley Unit-2 deplugged tube growth rates based on weighting the two separate growth distributions by the number of each type of indication returned to service. However, as there a only a total of 7 indications active in the deplugged tubes returned to service for Cycle 15 (the rest are sleeved), the growth distributions used for Cycle 15 projections are essentially the same as the Cycle 14 distributions.

4.0 Leak and Tube Analysis Methods

Monte Carlo analysis methods are used to calculate the SLB leak rates and tube burst probabilities for the actual voltage distributions. The methodology used complies with the Farley Unit 1 SER (Reference 2) and GL 95-05 (Reference 1) and is described in the Westinghouse generic methods report of Reference 2. NDE uncertainties applied for the Cycle 14 voltage distributions in the Monte Carlo analyses for leak rate and burst probability are the same as those described in the Farley Unit 1 APC report of Reference 3. SLB leak and tube burst correlations based on the database for 7/8" diameter tubes documented in Reference 4 were applied. The database does not meet the NRC requirement for a leak correlation and therefore the SLB leak rate was assumed to be independent of bobbin voltage. Leak rates and burst probabilities calculated using the actual voltage distributions are compared with the corresponding prior projections for EOC-14.

5.0 SLB Leak Rate and Tube Burst Probability for EOC-14

Using the methodology described above, analyses were performed to calculate EOC-14 SLB leak rates and tube burst probabilities for the actual bobbin voltage distribution presented in Table 1. The results are summarized on Table 3. The corresponding results from the calculations performed during the last outage to project EOC-14 leak rates and tube burst probabilities are also shown in Table 3. A comparison of the EOC-14 actuals to the corresponding predictions indicates the following:

b) The actual number of indications found during EOC-14 inspection in all SGs are significantly below those projected during the last outage. The peak voltage measured is the same or lower for SGs A and B, but a single indication of

magnitude 13.7 volts found in SG-C exceeded the projection.

a) SG-C was projected to be the limiting steam generator for EOC-14 based on EOC-13 EC data and SG-C was also determined to have the highest SLB leak rate based on actual EC bobbin measurements for EOC-14. For all SGs, SLB leak rate based on the actual voltages is less than the projections with a POD of 0.6; they are also below the acceptance limit (11.4 gpm).

c) For SGs A and B, tube burst probability based on the actual voltages is less than the projections with a POD of 0.6; they are also below the NRC acceptance limit of 10^{-2}. The tube burst probability of 5.2×10^{-3} based on actual voltages for SG-C exceeds its projected value, but it is still much lower than the allowable limiting value of 10^{-2}. The difference between the actual and projected burst probability in SG-C is attributable just to the single large indication (13.7 volts) found above the predicted peak voltage (7.6 volts).

In summary, the limiting SLB leak rate (7.6 gpm) and tube burst probability (5.2×10^{-3}) calculated using the actual measured EOC-14 bobbin voltage distributions are below the corresponding limits (11.4 gpm and 10^{-2}, respectively). In the limiting SG-C, the leak rate of 7.6 gpm based on the actual voltages is less than the 10.2 gpm projected using a constant POD value of 0.6, and the burst probability of 5.2×10^{-3} exceeds the projected value of 1.4×10^{-3}. The results meet the APC requirement for continued operation.

6.0 Leak and Tube Burst Projections for EOC-15

Monte Carlo analyses have also been performed to predict the EOC-15 performance of all three steam generators in Farley Unit-1, and the results are summarized in Table 3. The results are preliminary pending determination of the final tube repair list following completion of sleeving operation. As discussed in Section 3, an allowance was made to account for potentially increased growth in indications among deplugged tubes returned to service for Cycle 15. A composite growth distribution obtained by combining Cycle 14 growth distribution with the Farley Unit-2 deplugged tube growth rates, based on weighting the two separate growth distributions by the number of each type of indication returned to service, was used for Cycle 15 projections.

Since SG-C has both the highest number indications as well as the largest indication returned to service for Cycle 15, it was projected to be the limiting SG. The predicted EOC-15 SLB leak rate for SG-C based on the present licensing-basis database and method (constant POD of 0.6 and a leak rate independent of voltage) is 15.4 gpm which exceeds the current licensed limit of 11.4 gpm. However, a license amendment

to revise the acceptable SLB leakage limit to 19 gpm is pending and it envelopes the projected leak rate. The EOC-15 SLB tube burst probabilities for all three SGs are below the NRC reporting guideline for tube burst probability of 1.0×10^{-2} . Thus, projected EOC-15 results meet the APC requirement for continued operation.

The use of a POD value of 0.6 is conservative beyond 1 volt and it is unrealistic beyond about 3 volts where POD is likely to be unity. So, the EOC-15 SLB leak rate and tube burst probability for SG-C were also estimated using two other POD distributions: 1) a step distribution with POD=0.6 up to 10 volts and POD=1 above 10 volts, 2) voltage-dependent POPCD distribution presented in Reference 5. These results are also shown in Table 3. The step POD distribution affects only the contribution of the 13.7 volt, repaired indication which is large enough to reduce the projected SLB burst probability for SG-C by 50% (from 9.6×10^{-3} to 6.3×10^{-3}), further increasing margin to the allowable limit. With the voltage-dependent POPCD, the SLB burst probability is further reduced to 4.4×10^{-3}, and the leak rate is reduced to 9.6 gpm which is within the current limit of 11.4 gpm.

7.0 References

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

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

3. SG-96-01-003, "Farley Unit-1, 1995 Interim Plugging Criteria 90 Day Report," Westinghouse Nuclear Services Division, January 1996.

4. NSD-SGD-1212, "EPRI ARC Databases for 3/4" and 7/8" Dia. Tubes and Updated ARC Correlation for 7/8" Dia. Tubes," Westinghouse memorandum dated February 26, 1996 transmitted to Duquesne Light Company and Tennessee Valley Authority.

5. SG-97-03-001, "Farley Unit-2, 1996 Alternate Plugging Criteria 90 Day Report," Westinghouse Nuclear Services Division, March 1997.

Table 1 (Sheet 1 of 2)
Farley Unit 1April 1997 Outage
Summary of Inspection and Repair For Tubes in Service During Cycle 14

Voltage Bin	Steam Generator A							Steam Generator B						
	In-Service During Cycle				BOC-15	EOC-14	Cycle - 15	In-Service During Cycle				BOC-15	EOC-14	Cycle - 15
	Field Bobbin Indications	RPC Inspected	RPC Confirmed	Indications Repaired	All Tubes RTS	Deplugged Tubes Returned to Service	All Tubes Returned to Service	Field Bobbin Indications	RPC Inspected	RPC Confirmed	Indications Repaired	All Tubes RTS	Deplugged Tubes Returned to Service	All Tubes Returned to Service
0.3	1	0	0	0	1	0	1	3	1	1	1	2	0	2
0.4	15	2	2	3	12	0	12	25	4	3	3	22	0	22
0.5	36	6	4	6	30	0	30	59	4	2	5	54	0	54
0.6	63	13	9	11	52	4	56	104	9	7	7	97	0	97
0.7	88	10	9	10	78	0	78	97	3	3	4	93	0	93
0.8	85	10	10	13	72	0	72	125	13	9	11	114	0	114
0.9	102	12	11	9	93	0	93	113	10	8	15	98	0	98
1	87	6	6	7	80	2	82	116	9	8	10	106	0	106
1.1	84	2	2	3	81	0	81	92	9	5	11	81	0	81
1.2	60	8	5	10	50	0	50	71	4	4	4	67	0	67
1.3	62	2	1	4	58	0	58	49	4	3	9	40	0	40
1.4	50	3	2	2	48	0	48	46	5	4	8	38	0	38
1.5	40	5	5	5	35	0	35	35	4	3	5	30	0	30
1.6	27	3	3	3	24	0	24	23	3	1	3	20	0	20
1.7	30	2	1	2	28	0	28	10	0	0	1	9	0	9
1.8	23	4	3	3	20	0	20	8	2	2	2	6	0	6
1.9	15	2	1	2	13	0	13	9	4	2	5	4	0	4
2	16	5	3	5	11	0	11	5	1	0	2	3	0	3
2.1	8	8	7	7	1	0	1	3	3	2	2	1	0	1
2.2	9	9	8	8	1	0	1	2	2	1	1	1	0	1
2.3	4	4	3	3	1	0	1	6	6	6	6	0	0	0
2.4	4	4	4	4	0	0	0	2	2	2	2	0	0	0
2.5	2	2	2	2	0	0	0	4	4	2	3	1	0	1
2.6	2	2	2	2	0	0	0	2	2	2	2	0	0	0
2.7	3	3	1	1	2	0	2	2	2	2	2	0	0	0
2.8	0	0	0	0	0	0	0	2	2	2	2	0	0	0
2.9	1	1	1	1	0	0	0	0	0	0	0	0	0	0
3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
3.1	0	0	0	0	0	0	0	1	1	1	1	0	0	0
3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.35	1	1	1	1	0	0	0	0	0	0	0	0	0	0
13.74	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	921	132	109	130	791	6	797	1014	113	85	127	887	0	887
> 1V	444	73	58	71	373	0	373	372	60	44	71	301	0	301
> 2V	37	37	32	32	5	0	5	24	24	20	21	3	0	3

Table 1 (Sheet 2 of 2)
Farley Unit 1 April 1997 Outage
Summary of Inspection and Repair For Tubes in Service During Cycle 14

Voltage Bin	Steam Generator C							Composite of All SGs						
	In-Service During Cycle				BOC-15	EOC-14	Cycle - 15	In-Service During Cycle				BOC-15	EOC-14	Cycle - 15
	Field Bobbin Indications	RPC Inspected	RPC Confirmed	Indications Repaired	All Tubes Returned to Service	Deplugged Tubes Returned to Service	All Tubes Returned to Service	Field Bobbin Indications	RPC Inspected	RPC Confirmed	Indications Repaired	All Tubes Returned to Service	Deplugged Tubes Returned to Service	All Tubes Returned to Service
0.3	1	0	0	0	1	0	1	5	1	1	1	4	0	4
0.4	6	0	0	0	6	0	6	46	6	5	6	40	0	40
0.5	16	3	2	4	12	0	12	111	13	8	15	96	0	96
0.6	68	7	5	9	59	0	59	235	29	21	27	208	4	212
0.7	77	10	3	11	66	0	66	262	23	15	25	237	0	237
0.8	95	8	3	7	88	1	89	305	31	22	31	274	1	275
0.9	101	19	11	18	83	0	83	316	41	30	42	274	0	274
1	114	19	15	18	96	0	96	317	34	29	35	282	2	284
1.1	94	12	8	13	81	0	81	270	23	15	27	243	0	243
1.2	106	8	3	4	102	0	102	237	20	12	18	219	0	219
1.3	103	13	6	11	92	0	92	214	19	10	24	190	0	190
1.4	86	8	7	8	78	0	78	182	16	13	18	164	0	164
1.5	72	11	7	5	67	0	67	147	20	15	15	132	0	132
1.6	44	44	28	9	35	0	35	94	50	32	15	79	0	79
1.7	32	32	22	6	26	0	26	72	34	23	9	63	0	63
1.8	30	30	18	3	27	0	27	61	36	23	8	53	0	53
1.9	20	20	13	2	18	0	18	44	26	16	9	35	0	35
2	29	29	23	5	24	0	24	50	35	26	12	38	0	38
2.1	7	7	6	6	1	0	1	18	18	15	15	3	0	3
2.2	13	13	9	9	4	0	4	24	24	18	18	6	0	6
2.3	7	7	2	2	5	0	5	17	17	11	11	6	0	6
2.4	5	5	5	5	0	0	0	11	11	11	11	0	0	0
2.5	3	3	3	3	0	0	0	9	9	7	8	1	0	1
2.6	3	3	2	3	0	0	0	7	7	6	7	0	0	0
2.7	1	1	1	1	0	0	0	6	6	4	4	2	0	2
2.8	0	0	0	0	0	0	0	2	2	2	2	0	0	0
2.9	2	2	1	1	1	0	1	3	3	2	2	1	0	1
3	2	2	2	2	0	0	0	5	5	5	5	0	0	0
3.1	0	0	0	0	0	0	0	1	1	1	1	0	0	0
3.2	1	1	1	1	0	0	0	1	1	1	1	0	0	0
3.76	1	1	1	1	0	0	0	1	1	1	1	0	0	0
6.35	0	0	0	0	0	0	0	1	1	1	1	0	0	0
13.74	1	1	1	1	0	0	0	1	1	1	1	0	0	0
Total	1140	319	208	168	972	1	973	3075	564	402	425	2650	7	2657
> 1V	662	253	169	101	561	0	561	1478	386	271	243	1235	0	1235
> 2V	46	46	34	35	11	0	11	107	107	86	88	19	0	19

Table 2
Farley Unit 1 April 97
Signal Growth Statistics For Cycle 14 on an EFPY Basis

Delta Volts	Steam Generator A			Steam Generator B			Steam Generator C			Cumulative		
	Cycle 13	Cycle 14		Cycle 13	Cycle 14		Cycle 13	Cycle 14		Cycle 13	Cycle 14	
	CPDF	No. of Inds	CPDF	CPDF	No. of Inds	CPDF	CPDF	No. of Inds	CPDF	CPDF	No. of Inds	CPDF
-0.4	0.0	0	0.0	0.001	0	0.0	0.001	0	0.0	0.001	0	0.0
-0.3	0.004	0	0.0	0.009	0	0.0	0.004	0	0.0	0.005	0	0.0
-0.2	0.024	1	0.001	0.031	1	0.001	0.009	6	0.005	0.021	8	0.003
-0.1	0.107	8	0.01	0.107	6	0.007	0.059	19	0.022	0.089	33	0.013
0	0.337	100	0.118	0.387	116	0.121	0.245	98	0.108	0.317	314	0.115
0.1	0.667	389	0.541	0.754	492	0.607	0.697	383	0.444	0.706	1264	0.527
0.2	0.838	281	0.847	0.919	294	0.896	0.906	407	0.801	0.889	982	0.846
0.3	0.945	86	0.94	0.971	73	0.968	0.972	150	0.932	0.963	309	0.947
0.4	0.97	28	0.971	0.99	16	0.984	0.987	49	0.975	0.982	93	0.977
0.5	0.986	15	0.987	0.994	6	0.99	0.993	19	0.992	0.991	40	0.99
0.6	0.995	6	0.993	0.996	3	0.993	0.994	2	0.994	0.995	1'	0.993
0.7	0.997	2	0.996	0.996	5	0.998	0.996	2	0.996	0.996	9	0.996
0.8	0.999	0	0.996	0.996	0	0.998	0.996	2	0.997	0.997	2	0.997
0.9	0.999	1	0.997	0.996	1	0.999	0.996	1	0.998	0.997	3	0.998
1	0.999	1	0.998	0.996	0	0.999	0.996	0	0.998	0.997	1	0.998
1.1	1.0	1	0.999	0.999	0	0.999	0.996	0	0.998	0.998	1	0.999
1.2		0	0.999	0.999	0	0.999	0.996	1	0.999	0.998	1	0.999
1.4		0	0.999	0.999	1	1.0	0.997	0	0.999	0.998	1	0.9993
1.6		0	0.999	0.999	0		0.998	0	0.999	0.999	0	0.9993
2		0	0.999	1.0	0		0.998	0	0.999	0.999	0	0.9993
2.3		0	0.999		0		0.999	0	0.999	1.0	0	0.9993
2.5		1	1.0		0		0.999	0	0.999		1	0.9997
3.9		0			0		1.0	0	0.999		0	0.9997
9.4		0			0			1	1.0		1	1.0
Total		920			1014			1140			3074	

Table 3
Farley Unit 1 1997 EOC-14 Outage
Summary of Calculations of Tube Leak Rate and Burst Probability

Steam Generator	POD	Number of Indications	Max. Volts[1]	Burst Probability		SLB Leak Rate (gpm)
				1 Tube	2 Tubes	
EOC - 14 PROJECTIONS						
A	0.6	1276	6.9	7.5×10^{-4}	2.5×10^{-5}	7.1
B	0.6	1310	6.7	7.1×10^{-4}	1.9×10^{-5}	6.0
C	0.6	1545	7.6	1.4×10^{-3}	1.9×10^{-5}	10.2
EOC - 14 ACTUALS						
A	1	921	6.9	6.2×10^{-4}	1.9×10^{-5}	5.3
B	1	1014	3.7	1.9×10^{-4}	$< 4 \times 10^{-6}$	4.2
C	1	1140	14.9	5.2×10^{-3}	$< 4 \times 10^{-6}$	7.6
EOC - 15 PROJECTIONS[3]						
A	0.6	1411[2]	13.5	2.5×10^{-3}	5.9×10^{-5}	10.7
B	0.6	1563[2]	13.4	2.1×10^{-3}	$< 4 \times 10^{-6}$	9.3
C	0.6	1733[2]	14.7	9.6×10^{-3}	1.2×10^{-4}	15.6
	0.6 ≤ 10Volts 1.0 > 10 volts	1732[2]	14.1	6.3×10^{-3}	6.6×10^{-5}	15.4
	POPCD	1199[2]	13.0	4.4×10^{-3}	3.1×10^{-5}	9.6

Note:
(1) Voltages include NDE uncertainties from Monte Carlo analyses and exceed measured voltages.
(2) Adjusted for POD.
(3) Based on a Projected Cycle 15 length of 486 EFPD (1.33 EFPY)

Figure 1
Farley Unit 1 April 97 Outage
Bobbin Voltage Distributions at EOC-14 for Tubes in Service During Cycle 14

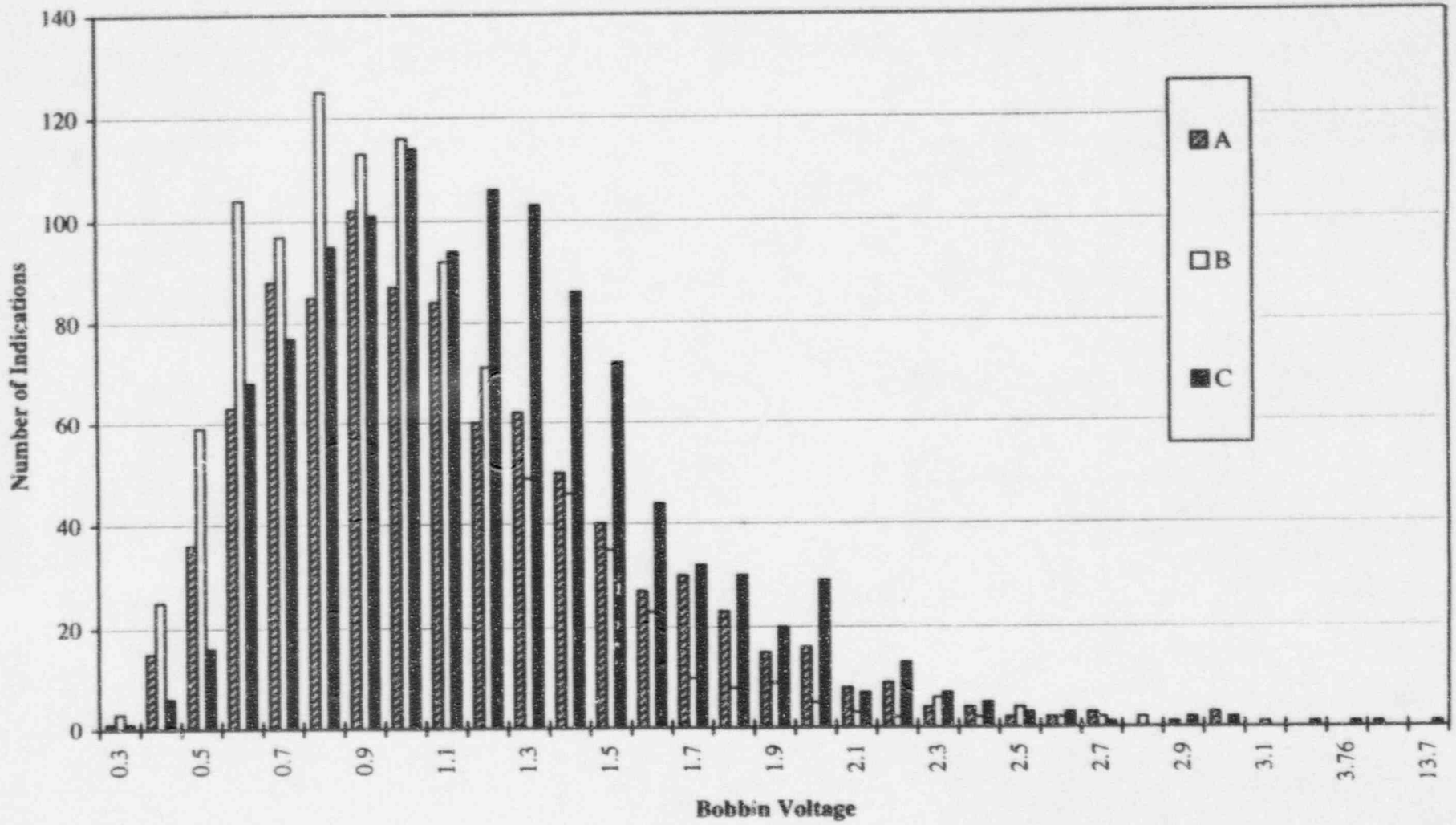
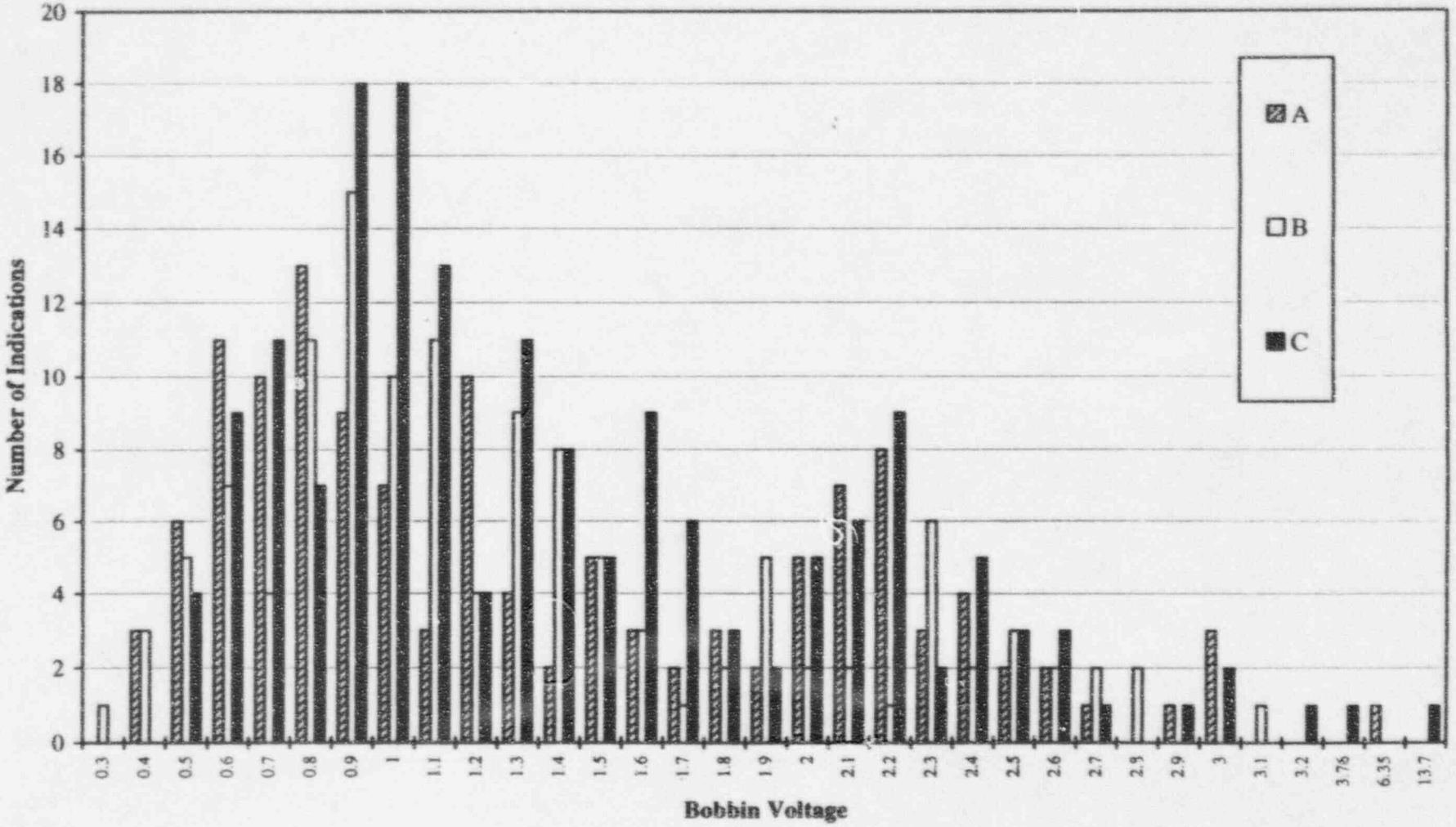
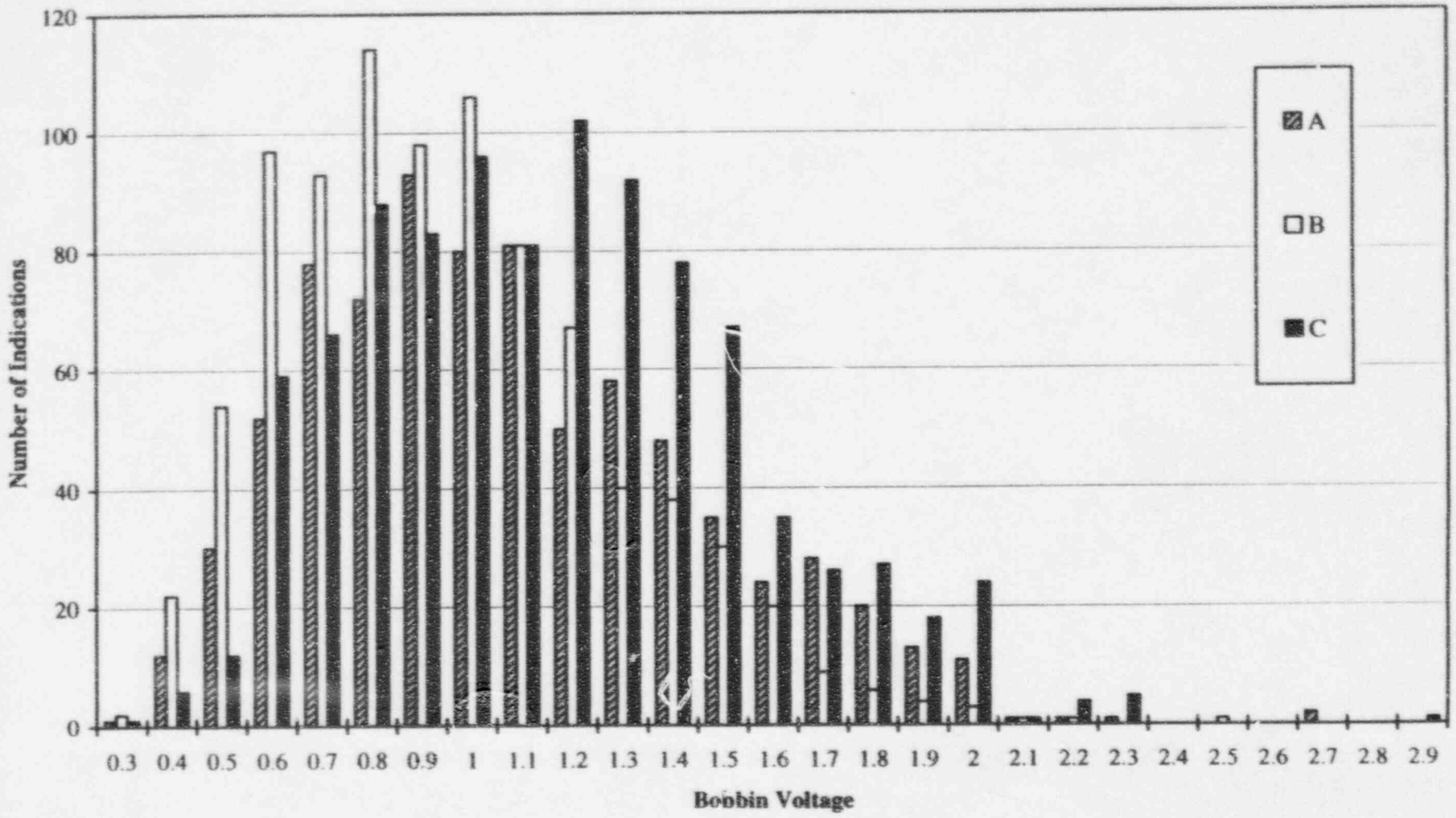


Figure 2
Farley Unit 1 April 97 M1Outage
Bobbin Voltage Distribution for Tubes Repaired After Cycle 14 Service



Bobburpc xlsFig2

Figure 3
Farley Unit 1 April 97 Outage
Bobbin Voltage Distributions for Tubes Returned to Service for Cycle 15



Boborpc xlsFig3

Figure 4
Farley Unit - 1 Growth History
Cumulative Probability Distributions for Voltage Growth on an EFPY Basis
Composite of All Three Steam Generators