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ACCESSION NBR:9110230096 DOC.DATE: 91/10/18 NOTARIZED: NO DOCKET #
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FITZPATRICK,E. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele
RECIP.NAME RECIPIENT AFFILIATION
MURLEY,T.E. Document Control Branch (Document Control Desk)

SUBJECT: Forwards corrected ltr from Wesinghouse that involves number of plugs installed by heat number re response to Bulletin 89-01.Licensee still concludes no plugs need replacement during 1992 refueling outage.

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Indiana Michigan
Power Company
P.O. Box 16631
Columbus, OH 43216

INDIANA MICHIGAN POWER

AEP:NRC:1096D

Donald C. Cook Nuclear Plant Unit 1
License No. DPR-58
Docket No. 50-315
ADDITIONAL INFORMATION RELATED TO NRC BULLETIN 89-01 SUPPLEMENT 2: FAILURE OF WESTINGHOUSE STEAM GENERATOR TUBE MECHANICAL PLUGS

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

Attn: T. E. Murley

October 18, 1991

Dear Dr. Murley:

Our letter AEP:NRC:1096C dated July 29, 1991, provided a response to NRC Bulletin 89-01 Supplement 2, entitled, "Failure of Westinghouse Steam Generator Tube Mechanical Plugs." The letter included as an attachment pages from Table 2 of WCAP 12244 Addendum 2. These pages, revised July 11, 1991, provided data regarding the number of installed plugs by heat number, and the remaining lifetime of those plugs. By letter dated October 18, 1991, Westinghouse informed us of errors in the July 11, 1991 revision and provided corrected (non-proprietary) pages. This letter and the revised pages are included as Attachment 1. The errors resulted in a slight reduction in the estimate of remaining lifetime for the subject plugs. However, our conclusion that no plugs require repair or replacement during the upcoming 1992 refueling outage remains valid. For your convenience, we are retransmitting our original response to Bulletin 89-01, Supplement 2 as Attachment 2.

Our original response to NRC Bulletin 89-01 Supplement 2 was requested to be made under oath or affirmation according to the provisions of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f). Therefore, an oath is included with this revision.

Sincerely,

E. E. Fitzpatrick
Vice President

ldp

Attachments

A031

cc: D. H. Williams, Jr.
A. A. Blind - Bridgman
G. Charnoff
J. R. Padgett
A. B. Davis - Region III
NRC Resident Inspector - Bridgman
NFEM Section Chief

STATE OF OHIO)
COUNTY OF FRANKLIN)

Eugene E. Fitzpatrick, being duly sworn, deposes and says that he is the Vice President of licensee Indiana Michigan Power Company, that he has read the foregoing Response to NRC Bulletin 89-01 Supplement 2: Failure of Westinghouse Steam Generator Tube Mechanical Plugs and knows the contents thereof; and that said contents are true to the best of his knowledge and belief.

E E Fitzpatrick

Subscribed and sworn to before me this 18th

day of October, 1991.

Rita D. Hill
NOTARY PUBLIC

RITA D. HILL
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 6-23-94

Attachment 1 to AEP:NRC:1096D
Westinghouse Electric Corp. Letter
Dated October 18, 1991

Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

AEP-91-156

Mr. S. J. Brewer
American Electric Power Service Corporation
One Riverside Plaza
Columbus, OH 43216-6631

ET-NSL-OPL-II-91-605
October 18, 1991

Ref. 1: AEP-91-138

American Electric Power Service Corporation
Donald C. Cook Nuclear Plant Units 1 & 2
Clarification of AEP Information in WCAP-12244

Dear Mr. Brewer:

The purpose of this letter is to explain differences in the algorithm table for the Donald C. Cook Nuclear Plant as presented in WCAP-12244, Revision 3, Addendum 2 and recent information transmitted via Reference 1. The following attachment is provided with a detailed account of these differences. This letter provides non-proprietary versions of the attachments transmitted in Reference 1.

If you have any questions, please feel free to contact Christine M. Vertes at 412/374-5683 or myself at 412/374-3665.

Very truly yours,

J. N. Steinmetz, Manager
Central Region
Customer Projects Department

C. M. Vertes/lg
Attachment

cc: D. H. Malin
J. Jensen
M. Ackerman

Attachment

INTRODUCTION

The purpose of this document is to explain differences in the algorithm table for the D. C. Cook plant as presented in WCAP-12244, revision 3, addendum 2, and information transmitted to American Electric Power (AEP) on July 31, 1991. Specifically, the number of remaining effective full power days (EFPD's) diminished for all plugs, and for some groups of plugs the year to repair also diminished, e.g., those installed in May, 1989.

BACKGROUND

To prepare the WCAP algorithm table, entitled "Table 2: Westinghouse Alloy 600 Mechanical Plug Information," Westinghouse offered each utility the choice of:

1. Using a generic type calculation of EFPD's based on the calendar days elapsed since plug installation modified by a multiplying factor, usually 0.7, to estimate elapsed full temperature days of exposure for the plugs.

2. Submitting actual EFPD information for each group of plugs installed.

3. Providing Westinghouse with time and temperature information for each power cycle for calculation of a more precise estimate of EFPD's of exposure for the plugs.

AEP opted for the third choice. In October of 1990 time and temperature information was exchanged several times to provide an operating history for AEP through 10/20/90. A special purpose spreadsheet was developed to compute cumulative EFPD's based on the cycle information, and cumulative equivalent (corresponding to a selected reference temperature) EFPD's for each cycle. The calculated elapsed EFPD's were then used as input to the WCAP-12244 table under the heading "EFPD to Ref. Date." Following issuance of addendum 2 to the WCAP, additional calculations were performed for AEP to estimate the effect of variations of cycle operating temperatures. At this time it was noted that the calculation of cumulative EFPD's in the spreadsheet omitted 136 days of cycle 5, and 15 days of cycle 10.

DISCUSSION

Three example pages of the special purpose spreadsheet calculations of elapsed EFPD's are included with this attachment. Each is entitled "Calculation of Actual EFPD's from Plant Cycle Data." References to page numbers herein are with respect to the page numbers of those three spreadsheets. The information presented on each page is as follows:

1. Page 1 of 3 is a recreation of the spreadsheet as it was originally developed. This would have been based on the earliest received information and does not reflect the plant stop and start dates for the mid-cycle outages during cycles 5 and 10 of plant operation.

2. Page 2 of 3 is a recreation of the calculation as it was used for the preparation of addendum 2 to WCAP-12244, revision 3. It does include the stop and start dates for the mid-cycle outages during cycles 5 and 10 of plant operation. There were four erroneous formulas in the cells of this version which will be explained in detail.

3. Page 3 of 3 is the final revised version, which contains the more recent information supplied by AEP.

As noted, the information presented on Page 1 is as the spreadsheet was originally developed. The plant start and stop dates, actual EFPD's (from AEP), and the hot leg operating temperature, T_{hot}, were obtained for each cycle. The cumulative EFPD's from the start of plant operation to the end of any specific cycle is simply found as the sum of the cumulative EFPD's prior to that cycle plus the EFPD's during that cycle. Within the spreadsheet the EFPD's for each cycle are displayed in the column labeled "EFPD's." The cumulative EFPD's to the end of any cycle are displayed in the column headed "Cum. EFPD's." The value in any row of this column is simply found as the sum of the value in the preceding row plus the value in the same row and one column to the left. Following an adjustment for temperature the same calculations are performed to obtain the cumulative EFPD's at a reference temperature, T_{ref}, from the specific EFPD's at the reference temperature.

Because primary water stress corrosion cracking (PWSCC) is temperature dependent, any calculation of a estimate for a mechanical plug must be based on normalizing the prior operating exposure to a reference temperature. This would not be necessary if all cycles of operation were at the same temperature. Since most of the plant cycles were at a T_{hot} of 600°F this value was selected as the reference temperature. Thus, for each cycle up to and including cycle 8 the specific and cumulative effective EFPD's at the reference temperature are the same as the actual EFPD values. For cycle 9, however, the plant operated for 434.1 EFPD's at a T_{hot} of 594°F. Relative to the corrosion rate for the alloy 600 plug material this would be equivalent to operating for 340.3 EFPD's at the reference temperature, i.e., 600°F. The same adjustment is necessary for cycles 10 and 11. The net result of the temperature adjustments is that while the total reported number of EFPD's through 10/20/90 was 3706.6, this total would be 3304.9 if all cycles were at a T_{hot} of 600°F. This simply means that the same depth of corrosion cracking occurs in less time at a higher temperature.

In order to determine the environmental exposure that has occurred for plugs installed during any particular outage a reference date for that determination is selected, in this case 10/20/90. The number of effective days of exposure, "elapsed EFPD's," is simply found as the total number of effective EFPD's to the reference date minus the number of effective EFPD's that occurred prior to installation. This calculation is performed in the small table

in the middle of the page. The plug installation day is assumed to be on the 15th day of the plug installation month. This day does not have to correspond to the exact day of installation since it is only used for looking up information elsewhere in the spreadsheet and is not used for the actual calculations. Using the "Install Ref." date the "EFPD's Prior" are found by entering the upper table in the column labeled "Start." The cycle start date that occurs prior to the plug installation date is the last cycle of operation prior to the installation of the plugs. The same type of look up is performed to obtain the number of normalized EFPD's to the reference date. For example, for plugs installed in "9-83" the last cycle that started prior to "09/15/83" is number 7, thus the number of effective EFPD's that occurred prior to installation is 1990.6. Since the effective EFPD's to the reference date is 3304.9, the number of effective EFPD's that occurred after plug installation is 1314.4. The apparent error of 0.1 in this calculation is fictitious because the values in the spreadsheet are carried to more decimal places than printed.

It is to be noted that plugs were installed in December of 1980, however, the plant cycle information on page 1 does not account for any plant shut down at that time, i.e., cycle 5 was listed as extending from 8/4/80 through 5/29/81. Subsequent information revealed that cycle 5 was interrupted from 12/25/80 through 1/5/81. In addition, it was found that operation during cycle 10 was not constant at 595°F, and included 15 days of operation at 600°F.

To incorporate the split cycle information in the spreadsheet the following changes were made:

1. One row was inserted below cycle 5 and one below cycle 10.

2. The date and temperature information for each of the new rows was entered, changing the "Cycle" labels accordingly.

3. The formulas for the cumulative EFPD's and temperature adjustment were copied into the blank cells at the appropriate locations.

Page 2 of 3 of the attached tables shows the results of making the above changes. The action of step 1 resulted in formulas in four of the cells that were no longer valid. The specific cells affected are enclosed in thick lines and the text is shown in italics, bold print. When a cell formula is copied in Lotus, it retains a relative reference, e.g., the cumulative formula which adds the value above it to the value to the left of it still performs the same function when copied to another location. When a cell formula is moved to another location it retains an absolute reference, i.e., the cumulative formula would continue to add the values in the original two cells. When a row is inserted in a Lotus spreadsheet the formula references may retain relative or absolute characteristics. Following the insertion of a row, the cumulative formula retains a relative reference to the cell value on its left, and an absolute reference to the cell that was above it before the insertion, i.e., it now adds the cell value two rows above it to the cell value on its left. Thus, the cumulative value of 1589.8 EFPD's is the sum of the cumulative at the end of cycle 5.a (1326.3), and the specific for cycle 6 (263.6). The net effect is that the cumulative value for all cycles after the insertion does not include the EFPD's for the new cycle data entered into the inserted

row, i.e., 135.8 for the example. This same loss of accumulation with the insertion of a row to split cycle 10, i.e., the cumulative at the end of cycle 11 is missing an additional 15 EFPD's at 600°F.

As an example, consider the effect on the elapsed EFPD's for plugs installed in 5-89. The number of EFPD's of operation to the reference date is missing a total of 150.8, i.e., 135.8 plus 15.0, while the number of days to the end of cycle 10.b is only missing 135.8. Thus, the number of elapsed EFPD's for those plugs, and all plugs installed after cycle 5.a, is low by 15.0 EFPD's at 600°F. In addition, since the cumulative EFPD's of operation through cycle 5.b is correct, i.e., includes the 135.8 days of operation during that cycle, the elapsed EFPD's for the plugs installed in 12-80 is low by 150.8. Page 3 of 3 contains the values obtained after correcting the formulas for the four highlighted cells on page 2.

ANALYSIS

As noted, the plugs installed in 5-89 experienced 208.8 EFPD's of exposure at a reference temperature of 600°F, instead of the 193.8 days as reported in addendum 2. Thus, in the algorithm spreadsheet the number of EFPD's to the reference date was increased to 208.8. The remaining EFPD's to minimum ligament then decreased by 31 days, from 1156 to 1125 days. The reason for this result is that adding 15 days of exposure at 600°F is equivalent to reducing the allowable remaining exposure at 582°F by 31 days. The effect on the remaining allowable exposure is greater for the plugs installed in 12-80. The missing 150.8 EFPD's at 600°F for the total operation of the plant results in a reduction of the remaining allowable exposure at 582°F of 315.6 EFPD's, decreasing the remaining allowable EFPD's from 6907 to 6591.

For the plugs installed in 5-89 the formulas in the algorithm spreadsheet calculate that the plug could experience a total of 746 EFPD's of operation at 600°F before PWSCC would progress to the maximum allowable depth, i.e., such that only the minimum allowable ligament would remain. Since the experienced exposure, 208.8 EFPD's, and the total allowable exposure, 746 EFPD's, are both at the reference temperature of 600°F the remaining allowable exposure can be determined by subtraction to be 537.2 EFPD's at 600°F. Since the plant operating temperature following 10/20/90 is specified to be 582°F, the remaining number of EFPD's needs to be converted to that temperature base. The result in the WCAP table is 1125 EFPD's. An order of magnitude check can be made using the Page 3 information since for cycle 11 the 437.0 days of operation at 582°F is equivalent to 208.8 EFPD's at 600°F., i.e., 537.2 EFPD's at 600°F times (437.0/208.8) equals 1124.3 days at 582°F.

The final question to be answered is: "given that the allowable exposure for the plugs is 1125 EFPD's at 582°F after 10/20/90, when should remedial action be taken?" It is thus necessary to be able to convert from EFPD's to calendar days. The basis for this conversion was the cycle 11 operating information. The plant operated for 437 EFPD's during a time period in which 581 calendar days elapsed, i.e., the accrual of each EFPD took 1.33 calendar days. Thus, 1125 EFPD's of future operation would be expected to take 1496 calendar days. The allowable exposure time for the plugs would then be 4

years and 35 days beyond 10/20/90, making the calculated latest remedial action date November 24, 1994. This date is then truncated to be 1994 for the calculated year of expected 360° cracking to the minimum allowable ligament. **The printed value in the WCAP table is one year earlier than the calculated value, i.e., 1993, to provide a buffer period.** Note that for the 5-89 plugs the loss of 31 EFPD's is then equivalent to the loss of 41 calendar days. The recommended year to repair plugs, which was initially reported as 1994, decreased to 1993 as a result of the revisions to the cumulative EFPD formulas. Interrogation of the spreadsheet indicates that the reported 1994 year value in addendum 2 resulted from truncating and subtracting the one year buffer from January 4, 1995 (41 calendar days after November 24, 1994).

All of the preceding discussion applies exactly to the information presented for the plugs on the hot leg. The elapsed EFPD's calculated for the hot leg plugs were used as input to the algorithm table for both the hot and cold legs. This is not strictly precise since the 18° F temperature difference has a larger effect at lower temperatures. This means that the elapsed effective EFPD's for the cold leg plugs would be about 20 to 40 days less than the corresponding values for the hot leg plugs. Thus, the use of the elapsed EFPD's for the hot leg plugs is conservative. As an example of the effect of the changes on values reported for the cold leg plugs, the 15 EFPD's missing in cycle 10 would be taken at 536° F. These would be equivalent to 34 EFPD's at 518° F. Thus, the remaining EFPD's of 26459 reported for the 5-89 plugs in addendum 2 becomes 26425 EFPD's as a result of the correction to the spreadsheet formulas.

SUMMARY

In summary, the change on the number of remaining EFPD's was due to revised calculations of the elapsed EFPD's, while the change in the year to repair plugs is mainly due to truncating the calculated date to report only the year in which action is recommended. A non-proprietary version of the corrected AEP information, corresponding to the format of Table 2. of WCAP-12244 is also included as part of this attachment. The information contained is unchanged from July 31, 1991.

Calculation of *Actual EFPD's* from Plant Cycle Data

AEP (*D. C. Cook 1*)

RFK
10/15
File: AEP_FPD.WK1

Cycle	Start	Stop	EFPD's	Cum. EFPD's	T–hot	EFPD's at T_ref	Cum. at T_ref	Cal. Days	EFPD Factor
0	01/18/75	01/18/75	0	0		0	0	0	
1	01/18/75	12/24/76	375.3	375.3	600.0	375.3	375.3	706	0.532
2	02/20/77	04/06/78	290.6	665.9	600.0	290.6	665.9	468	0.621
3	06/18/78	04/06/79	257.4	923.4	600.0	257.4	923.4	365	0.705
4	07/08/79	05/30/80	268.0	1191.4	600.0	268.0	1191.4	420	0.638
5	08/04/80	05/29/81	270.6	1462.0	600.0	270.6	1462.0	364	0.743
6	08/01/81	07/03/82	263.6	1725.6	600.0	263.6	1725.6	400	0.659
7	09/15/82	07/16/83	265.0	1990.6	600.0	265.0	1990.6	378	0.701
8	10/19/83	04/06/85	410.5	2401.1	600.0	410.5	2401.1	630	0.652
9	11/13/85	06/27/87	434.1	2835.2	594.0	340.3	2741.4	812	0.419
10	10/04/87	03/18/89	434.4	3269.6	595.0	354.7	3096.1	630	0.563
11	06/30/89	10/20/90	437.0	3706.6	582.0	208.8	3304.9	581	0.359
			3706.6			3304.9		5754.0	0.574

D_ref	10/20/90	D_val	10/20/90	Value for the "Reference Date."	437/581 = 0.752
Q/R	45294.41				
T_abs	459.67	T_ref	600.0	Reference temperature to normalize the EFPD's to.	

Normalized EFPD's to the "Reference Date" = 3304.9 days.

Plug Information

EFPD values are normalized values based on the use of the reference temperature.

Plug Install	Install Ref.	EFPD's Prior	Elapsed EFPD's
12–80	12/15/80	1462.0	1842.9
7–82	07/15/82	1725.6	1579.3
9–83	09/15/83	1990.6	1314.4
6–85	06/15/85	2401.1	903.8
7–87	07/15/87	2741.4	563.5
5–89	05/15/89	3096.1	208.8

NOTES: Plant cycle information taken from a facsimile transmittal from AEP to Westinghouse on 10/29/90.

This is the page as it appeared **prior** to October 30, 1990. The information does not reflect the later division of Cycles 5 and 10 into sub–cycles. **It does not contain the more current information and was prepared for the purpose of illustration only.**

Calculation of *Actual EFPD's* from Plant Cycle Data

AEP (*D. C. Cook 1*)

RFK
10/15
File: AEP_FPD.WK1

Cycle	Start	Stop	EFPD's	Cum. EFPD's	T-hot	EFPD's at T_ref	Cum. at T_ref	Cal. Days	EFPD Factor
0	01/18/75	01/18/75	0	0		0	0	0	
1	01/18/75	12/24/76	375.3	375.3	600.0	375.3	375.3	706	0.532
2	02/20/77	04/06/78	290.6	665.9	600.0	290.6	665.9	468	0.621
3	06/18/78	04/06/79	257.4	923.4	600.0	257.4	923.4	365	0.705
4	07/08/79	05/30/80	268.0	1191.4	600.0	268.0	1191.4	420	0.638
5.a	08/04/80	12/25/80	134.8	1326.3	600.0	134.8	1326.3	209	0.645
5.b	01/05/81	05/29/81	135.8	1462.0	600.0	135.8	1462.0	155	0.876
6	08/01/81	07/03/82	263.6	*1589.8*	600.0	263.6	*1589.8*	400	0.659
7	09/15/82	07/16/83	265.0	1854.8	600.0	265.0	1854.8	378	0.701
8	10/19/83	04/06/85	410.5	2265.3	600.0	410.5	2265.3	630	0.652
9	11/13/85	06/27/87	434.1	2699.5	594.0	340.3	2605.7	812	0.419
10.a	10/04/87	03/03/89	419.4	3118.8	595.0	342.5	2948.1	615	0.557
10.b	03/04/89	03/18/89	15.0	3133.8	600.0	15.0	2963.1	15	1.000
11	06/30/89	10/20/90	437.0	*3555.9*	582.0	208.8	*3156.9*	581	0.359
			3706.6			3307.7		5754.0	0.575

D_ref	10/20/90	D_val	10/20/90	Value for the "Reference Date."
Q/R	45294.41			
T_abs	459.67	T_ref	600.0	Reference temperature to normalize the EFPD's to.

437/581 = 0.752

Normalized EFPD's to the "Reference Date" = 3156.9 days.

Plug Information

EFPD values are normalized values based on the use of the reference temperature.

Plug Install	Install Ref.	EFPD's Prior	Elapsed EFPD's
12-80	12/15/80	1326.3	1830.7
7-82	07/15/82	1589.8	1567.1
9-83	09/15/83	1854.8	1302.1
6-85	06/15/85	2265.3	891.6
7-87	07/15/87	2605.7	551.2
5-89	05/15/89	2963.1	193.8

NOTES: Plant cycle information taken from a facsimile transmittal from AEP to W on 10/29/90. A subsequent telephone discussion was held on 10/30/90 with AEP to clarify the installation of plugs in the middle of Cycle Number 5.

This is the page as it appeared on October 30, 1990, and was telecopied to AEP on November 1, 1990. **It does not contain the more current information and was prepared for the purpose of illustration only.**

Calculation of *Actual EFPD's* from Plant Cycle Data

AEP (*D. C. Cook 1*)

RFK
10/15
File: AEP_FPD.WK1

Cycle	Start	Stop	EFPD's	Cum. EFPD's	T–hot	EFPD's at T_ref	Cum. at T_ref	Cal. Days	EFPD Factor
0	01/18/75	01/18/75	0	0		0	0	0	
1	01/18/75	12/24/76	375.3	375.3	600.0	375.3	375.3	706	0.532
2	02/20/77	04/06/78	290.6	665.9	600.0	290.6	665.9	468	0.621
3	06/18/78	04/06/79	257.4	923.4	600.0	257.4	923.4	365	0.705
4	07/08/79	05/30/80	268.0	1191.4	600.0	268.0	1191.4	420	0.638
5.a	08/04/80	12/25/80	134.8	1326.3	600.0	134.8	1326.3	209	0.645
5.b	01/05/81	05/29/81	135.8	1462.0	600.0	135.8	1462.0	155	0.876
6	08/01/81	07/03/82	263.6	1725.6	600.0	263.6	1725.6	400	0.659
7	09/15/82	07/16/83	265.0	1990.6	600.0	265.0	1990.6	378	0.701
8	10/19/83	04/06/85	410.5	2401.1	600.0	410.5	2401.1	630	0.652
9	11/13/85	06/27/87	434.1	2835.2	594.0	340.3	2741.4	812	0.419
10.a	10/04/87	03/03/89	419.4	3254.6	595.0	342.5	3083.9	615	0.557
10.b	03/04/89	03/18/89	15.0	3269.6	600.0	15.0	3098.9	15	1.000
11	06/30/89	10/20/90	437.0	3706.6	582.0	208.8	3307.7	581	0.359
			3706.6	OK		3307.7	OK	5754.0	0.575

D_ref	10/20/90	D_val	10/20/90	Value for the "Reference Date."	437/581 = 0.752
Q/R	45294.41				
T_abs	459.67	T_ref	600.0	Reference temperature to normalize the EFPD's to.	

Normalized EFPD's to the "Reference Date" = 3307.7 days.

Plug Information

EFPD values are normalized values based on the use of the reference temperature.

Plug Install	Install Ref.	EFPD's Prior	Elapsed EFPD's
12–80	12/15/80	1326.3	1981.4
7–82	07/15/82	1725.6	1582.1
9–83	09/15/83	1990.6	1317.1
6–85	06/15/85	2401.1	906.6
7–87	07/15/87	2741.4	566.2
5–89	05/15/89	3098.9	208.8

NOTES: Plant cycle information taken from a facsimile transmittal from AEP to W on 10/29/90. A subsequent telephone discussion was held on 10/30/90 with AEP to clarify the installation of plugs in the middle of Cycle Number 5.

This page contains the final, checked version of the plant operating information. It was telecopied to AEP on July 31, 1991. **This information was used in the algorithm table of 7/31/91.**

Alloy 600 Mechanical Plug
Date Revised: 09/04/91

File: AEP_CLS3.WK1

Table 2: Westinghouse Alloy 600 Mechanical Plug Information

INSTALLATION DATA						TEMPERATURE DATA						PLUG DATA		EFPD DATA					STATUS				
Std Plant Alpha	Plug Inst Date	No. of Plug	Plug Heat No.	S/G #	HL or CL	Previous Cycle (°F) (A) HL	Previous Cycle (°F) (A) CL	New Cycle (°F) (A) HL	New Cycle (°F) (A) CL	Total Scaling Factor (B) Prev.	Total Scaling Factor (B) New	Plug Size (in)	Min. Lig. (mils)	Initial EFPD to MIN (C)	Ref. Calc. Date (D)	EFPD Mult. Factor (E)	EFPD to Ref. Date (F)	Remain EFPD to MIN (C)	Year to Repair Plugs (G)	Notes	Plugs Re-pair-ed	Plugs Re-mov-ed	T/S Joint Type (H)
	07-87	90	4523	14	HL	600.0	536.0	582.0	518.0			7/8		549	10/20/90	0.75	566.2	0	< Ref.	–	–	90	PR
	07-87	69	4523	11	HL	600.0	536.0	582.0	518.0			7/8		549	10/20/90	0.75	566.2	0	< Ref.	–	–	69	PR
	07-87	24	4523	13	HL	600.0	536.0	582.0	518.0			7/8		549	10/20/90	0.75	566.2	0	< Ref.	–	–	24	PR
	07-87	86	4523	12	HL	600.0	536.0	582.0	518.0			7/8		549	10/20/90	0.75	566.2	0	< Ref.	–	–	86	PR
	05-89	93	6323	13	HL	600.0	536.0	582.0	518.0			7/8		746	10/20/90	0.75	208.8	1125	1993	–	–	–	PR
	05-89	40	6323	12	HL	600.0	536.0	582.0	518.0			7/8		746	10/20/90	0.75	208.8	1125	1993	–	–	–	PR
	05-89	91	6323	11	HL	600.0	536.0	582.0	518.0			7/8		746	10/20/90	0.75	208.8	1125	1993	–	–	–	PR
	05-89	20	6323	14	HL	600.0	536.0	582.0	518.0			7/8		746	10/20/90	0.75	208.8	1125	1993	–	–	–	PR
	05-89	37	6135	14	HL	600.0	536.0	582.0	518.0			7/8		2272	10/20/90	0.75	208.8	4318	2005	–	–	–	PR
	12-80	10	1989	11	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1981.4	6591	2013	–	–	–	PR
	12-80	10	1989	14	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1981.4	6591	2013	–	–	–	PR
	07-82	10	2387	12	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1582.1	7427	2016	–	–	–	PR
	07-82	10	2387	13	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1582.1	7427	2016	–	–	–	PR
	08-83	2	2387	11	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1317.1	7982	2018	–	–	–	PR
	08-83	2	2387	14	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1317.1	7982	2018	–	–	1	PR
	08-83	9	2387	13	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1317.1	7982	2018	–	–	–	PR
	08-83	3	2387	12	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	1317.1	7982	2018	–	–	–	PR
	06-85	5	2387	14	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	906.6	8841	2021	–	–	–	PR
	06-85	6	2387	13	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	906.6	8841	2021	–	–	–	PR
	06-85	8	2387	11	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	906.6	8841	2021	–	–	–	PR
	06-85	9	2387	12	HL	600.0	536.0	582.0	518.0			7/8		5131	10/20/90	0.75	906.6	8841	2021	–	–	–	PR
	07-87	86	4523	12	CL	600.0	536.0	582.0	518.0			7/8		8562	10/20/90	0.75	566.2	18476	2057	–	–	–	PR
	07-87	90	4523	14	CL	600.0	536.0	582.0	518.0			7/8		8562	10/20/90	0.75	566.2	18476	2057	–	–	–	PR
	07-87	24	4523	13	CL	600.0	536.0	582.0	518.0			7/8		8562	10/20/90	0.75	566.2	18476	2057	–	–	–	PR
	07-87	69	4523	11	CL	600.0	536.0	582.0	518.0			7/8		8562	10/20/90	0.75	566.2	18476	2057	–	–	–	PR
	05-89	91	6323	11	CL	600.0	536.0	582.0	518.0			7/8		11645	10/20/90	0.75	208.8	26425	2086	–	–	–	PR
	05-89	40	6323	12	CL	600.0	536.0	582.0	518.0			7/8		11645	10/20/90	0.75	208.8	26425	2086	–	–	–	PR
	05-89	93	6323	13	CL	600.0	536.0	582.0	518.0			7/8		11645	10/20/90	0.75	208.8	26425	2086	–	–	–	PR
	05-89	57	6135	14	CL	600.0	536.0	582.0	518.0			7/8		35448	10/20/90	0.75	208.8	81426	2286	–	–	–	PR
	12-80	10	1989	14	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1981.4	180408	2646	–	–	–	PR
	12-80	10	1989	11	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1981.4	180408	2646	–	–	–	PR
	07-82	10	2387	13	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1582.1	181331	2649	–	–	–	PR
	07-82	10	2387	12	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1582.1	181331	2649	–	–	–	PR
	08-83	2	2387	11	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1317.1	181943	2652	–	–	–	PR
	08-83	2	2387	14	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1317.1	181943	2652	–	–	–	PR

Table 2: Westinghouse Alloy 600 Mechanical Plug Information

INSTALLATION DATA						TEMPERATURE DATA						PLUG DATA		EFPD DATA					STATUS				
Std Plant Alpha	Plug Inst Date	No. of Plug	Plug Heat No.	S/G #	HL or CL	Previous Cycle (°F) (A)		New Cycle (°F) (A)		Total Scaling Factor (B)		Plug Size	Min. Lig.	Initial EFPD to MIN (C)	Ref. Calc. Date (D)	EFPD Mult. Factor (E)	EFPD to Ref. Date (F)	Remain EFPD to MIN (C)	Year to Repair Plugs (G)	Notes	Plugs Re-pair-ed	Plugs Re-mov-ed	T/S Joint Type (H)
						HL	CL	HL	CL	Prev.	New	(in)	(mils)										
	08-83	3	2387	12	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1317.1	181943	2652	–	–	–	PR
	08-83	9	2387	13	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1317.1	181943	2652	–	–	–	PR
	09-83	2	1989	14	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	1317.1	181943	2652	–	–	–	PR
	06-85	5	2387	14	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	906.6	182892	2655	–	–	–	PR
	06-85	6	2387	13	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	906.6	182892	2655	–	–	–	PR
	06-85	8	2387	11	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	906.6	182892	2655	–	–	–	PR
	06-85	9	2387	12	CL	600.0	536.0	582.0	518.0			7/8		80057	10/20/90	0.75	906.6	182892	2655	–	–	–	PR

Attachment 2 to AEP:NRC:1096D
Letter AEP:NRC:1096C
Dated July 29, 1991