PDR 50-317/318
and Return to
KAMAL NAIDU
MAIL STOP 9D4

BALTIMORE GAS AND ELECTRIC

CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

NUCLEAR ENGINEERING SERVICES DEPARTMENT
CALVERT CLIFFS NUCLEAR POWER PLANT
LUSBY, MARYLAND 20657

January 17, 1991

Mr. Kamal Naidu
U.S. Nuclear Regulatory Commission
Mail Stop 9D4
Washington, DC 20555

Dear Mr. Naidu:

Enclosed are copies of correspondence I have had with various General Electric offices regarding the AK-2A-25 Closing Spring problem. Additionally, in March 1989, I sent our AK-2A-25 NPRDS failure history to General Electric at San Jose. The individuals contacted at San Jose were Mr. George Strambach and Mr. F. C. Downey.

If I can be of any further assistance, please contact me at (301) 260-4953.

R. B. SYDNOR
Principle Engineer
E&C Systems Engineering Unit

RBS/dsp

cc: Pat Furio
System 58 File
E&C Unit File

9101250063 910117
PDR ADOCK 05000317
S PDR

DF01
1/1
Ltr Encl
Add. Kamal Naidu 1 1

February , 1989

Failure Info From other utility

TO: POEAC
J. A. Crunkelton

FROM: NETWORK Coordinator

SUBJECT: Nuclear NETWORK Information Item(s)

The information listed below is provided for your action/routing, as you deem appropriate.
Tim Noard, x-3972
Licensing Unit
1st Floor, Nuclear Engrg. Facility

* * * *

OE 3141 I GHODSI (DECO) 26-JAN-89 08:23 EST
SUBJECT: G.E. MODEL AKF-2-25 CIRCUIT BREAKER

UNIT.....FERMI 2
EVENT DATE.....JANUARY 11, 1989
NSS/A-3.....GE/DECO
RATING.....1093 MWE

EVENT DESCRIPTION:

A REACTOR RECIRCULATION M-G SET FIELD BREAKER (G.E. MODEL AKF-2-25) FAILED TO CLOSE DURING INSTALLATION TESTING. WHILE TESTING THE BREAKER, THE BREAKER LOCKING LEVER WAS IMPROPERLY LEFT IN THE UP OR DISENGAGED POSITION WITH THE BREAKER IN THE "TEST" POSITION. WHEN GIVEN AN ELECTRICAL CLOSE SIGNAL THE BREAKER TRIPPED FREE. SUBSEQUENT TESTS RESULTED IN BREAKER MALFUNCTION. INSPECTION REVEALED ONE OF THE TWO CLOSING SPRINGS HAD UNHOOKED AND MISALIGNMENT OF THE OPERATING MECHANISM WAS OBSERVED. IN ADDITION, THE CUTOFF SWITCH FAILED TO OPERATE. IT IS UNKNOWN AT THIS TIME IF THE IMPROPER LEVER POSITION CAUSED OR CONTRIBUTED TO THIS FAILURE OR MAY HAVE BEEN A PRE-EXISTING CONDITION. THIS BREAKER HAS BEEN REMOVED AND SHIPPED TO G.E. FOR FAILURE ANALYSIS.

RECOMMENDATION:

1. THE BREAKER LOCKING LEVER SHOULD BE IN THE DOWN OR ENGAGED POSITION WHENEVER OPERATING THE BREAKER.

2. IF THIS SITUATION OCCURS, AN INSPECTION OF THE CLOSING SPRINGS, OPERATING MECHANISM ALIGHMENT AND CUTOFF SWITCH SHOULD BE PERFORMED

INFORMATION CONTACT: J. WIEGAND (313) 586-5435

INFORMATION CONTACT: M. HOBBS (313) 586-1600

(M-2274)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 6/30/87

BY: Russ Sydnor

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: Steve St John

COMPANY: G&E

SUBJECT: U-2 TCB 5 Failure

NOTES:

Informed Steve of recent failure of U-2 TCB #5. (see 6/29/87 telecon w/ Kerry Riggelman) - Informed Steve of shunt device sloppy ~~Armature~~ & how TCB 5 FFA is of same batch as TCB 2 (F 505).

COPIES TO:

File

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 5/12/87

BY: Russ Sydnor

PURCHASE ORDER NO. -

REQN. NO.

SOR NO.

TELEPHONE CALL ☐ CONFERENCE ☒

WITH: Steve ST. John

COMPANY: General Electric

SUBJECT: GE 4K-24-25-1 Reactor Trip Breakers.

NOTES: Met with GE Rep. S. St. John, K. Riggleman, R. Weakley, J. Lea, S. Hayden, & C. Miller to discuss closing spring problem. Reviewed GE's testing (offsite & onsite on 5/11/87), discussed possible future actions for testing and correction. One consensus was to replace FFA's that are susceptible to this problem. Steve St. John stated he would arrange for GE to send BG&E new FFA's to replace the four FFF's that are installed and have experienced this problem. These new FFAs will be sent as WARRANTY replacements at no cost to BG&E.

Possible field mods to correct problem were discussed and rejected.

COPIES TO:

RTB, File.

GENERAL ELECTRIC

CONSTRUCTION EQUIPMENT BUSINESS
GENERAL ELECTRIC COMPANY • 41 WOODFORD AVENUE • PLAINVILLE, CONNECTICUT • 06062 (203) 747-7111

April 9, 1987

Baltimore Gas & Electric Company
Calvert Cliffs Nuclear Power Plant
Lusby, Maryland 20657

Attn.: Mr. Russ Sydnor - NESD

SUBJECT: AK-2A-25-1 - S/N 228A3189-200K

Dear Russ:

The following summarizes the results of our investigation to date of the AK-2A-25-1 closing spring problem.

1. The closing springs were removed from the subject breaker and underwent a dimensional check. The springs met both their dimensional and force specifications.

2. High-speed movies were taken of the breaker mechanism during close-open operations. The camera was focused on the closing springs. The films showed that there was no motion of the spring hooks. There was no clear indication of what or how the springs were coming unhooked. These are the same movies you reviewed during your trip to Plainville.

3. The breaker underwent a total of 400 close-open non-electrical interruption operations. The initial 250 operations were run at a speed of one close-open operation per minute. The remaining 150 operations were run at three close-open operations per minute. The closing springs remained hooked to their pins throughout the test.

   The closing voltage was set at 130-132 volts D.C. to agree with the site voltage level. We did not have an enclosure to test the breaker in, therefore the breaker was tested setting unclamped on the floor.

GENERAL ELECTRIC

We have not been able to duplicate the closing spring failure here in Plainville. Our investigation will continue during my visit to Calvert Cliffs. While at the site, we will be able to test and observe breaker operation under actual conditions.

Very Truly Yours,

Steve St. John

Steve St. John
Q.C. Engineer

cc: D. Dixon
M. Konikowski
W. Heerlein
A. Paullin - Burlington, IA.
P. Dwyer - Burlington, IA.
G. Saunders - King of Prussia, PA.

clt

(5019P)

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 3/11/87

BY: Russ Sydnor

PURCHASE ORDER NO. -

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: George Sanders / Steve ST. John

COMPANY: General Electric

SUBJECT: Meeting on Rx trip Breaker problems

NOTES:

1. George is trying to arrange for key GE people to come for an on-site meeting to discuss the Breaker issue. Steve St John (GE) at Plainville, CN has just completed a ~~250~~ 400 cycle duration Test run on our TCB they are inspecting. The sparing problem did not recur for them! Their next step is to tear down the TCB's FFA mechanism, for a detailed part by part inspection.

George will call back later this week with potential dates for on-site meeting.

2. Steve St. John called later to also discuss duration test run results. We also discussed potential on-site testing during U-2 outage.

COPIES TO:

File

CRM

CGM

February 9, 1987

TO: Distribution

FROM: R. B. Sydnor
E. R. Bauer

SUBJECT: Trip Report (CEDM Coil Stacks/Reactor Trip Breakers)

On February 4, 1987, we visited the Combustion Engineering Facility at Newington, New Hampshire to witness final assembly and testing of some new Unit-2 CEDM Coil Stacks. The CE-Newington facility manufactured the stainless steel coil stack housings and is performing the final assembly of the stacks, flexible conduits, and connectors. All parts had been received and the final assembly of the 56 coil stacks had commenced on February 2, 1987. CE is making good progress (7 coil stacks were completed by February 4) and the quality of workmanship was good. We witnessed assembly of three coil stacks and verified coil polarity and current check of one coil stack as well as the new design match-up to our existing CEDM shrouds. There should be no problem with delivery prior to Unit 2 Outage.

On February 5, 1987, we visited Steve St. John of General Electric at Plainville, Connecticut. Steve is leading the investigation of our closing spring problem on GE-AK-2A-25 Reactor Trip Breakers. He had made some high speed films of the closing springs during breaker opening and closing operations in hopes of determining why the springs are falling off. The films were helpful, but the root cause of the springs falling off has not been determined. We reviewed the history of the problem with Steve and discussed what additional efforts GE plans to make to resolve the problem. GE now seems convinced, as we are, that the problem is most likely an obscure manufacturing problem as it has only occurred on breakers with new front frame assemblies manufactured in the '83-'85 time frame. We will continue to closely track GE's progress on this issue.

R. B. Sydnor
Senior Engineer
Primary Systems Engineering Unit

E. R. Bauer
Engineering Analyst
Primary Systems Engineering Unit

RBS/ERB/klb

Distribution:

W. J. Lippold
J. R. Lemons/R. P. Heibel
A. R. Thornton
C. R. Mahon
R. W. Wenderlich
L. B. Russell
J. R. Dunn/K. M. Riggleman
D. P. Butler/R. F. Weekley
E. R. Zumwalt

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 1/9/87

BY: Russ Sydnor

PURCHASE ORDER NO. _____

REQN. NO. _____

SOR NO. _____

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: George Sanders

COMPANY: GE, King of Prussia

SUBJECT: U-1 TCB-7 Spring falling off

NOTES:

Called to inform George Rat problem had occurred on another TCB. & to ask him to progress testing at TCB-4 in Glanville, GA.

COPIES TO:

F-C

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 12/18/96

BY: Russ Sydnor

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: George Sanders (PA), GARY Schulz (Iowa)

COMPANY: GE

SUBJECT: TCB-4 failures, - Closing Springs falling off

NOTES: I called GE to update them on the latest TCB failure and request their assistance in further investigation of this problem. Design people at GE's Burlington Iowa plant are involved and additionally they plan to return the FFA I had sent them (from U-1 TCB #2) to the manufacturing plant for further testing. They will be getting back to me on testing of U-1 TCB #4 (whether to send TCB to them or their coming onsite to investigate)

COPIES TO:

File.

GEORGE SANDERS
1000 FIRST AVENUE
KING OF PRUSSIA, PA 19406

11/04/86

RE: BALTIMORE GAS & ELECTRIC CALVERT CLIFFS
AK 25 SPRING COMING OFF

Dear Mr. Sanders,

This letter will serve to document our telephone discussion of 11/03/86 concerning the AK 25 front frame from Baltimore Gas & Electric that had the closing spring come off. The Atlanta Service Shop and our design engineers here in Burlington have both inspected and operated the subject front frame many times and have not been able to repeat the problem with the mechanism or discover any defect in the mechanism.

This inspection has included physical and functional checks of the spring and other mechanism parts. We operated this front frame attached to one of our back frames both electrically and manually. Because we did not have the back frame [and cubicle] where the problem occurred we could be missing part of the puzzle.

We do not know of any other such failure for all the AK 25 breakers in service.

Because of this we will send a new front frame to you to send to the customer. This will be sent on our Shop Order 901462. Also we would like to be made aware of any future similar occurrence. We would probably want to have the complete breaker for testing.

Sincerely.

_____
Gary Schulz
Product Service

cc:Russ Sydnor BG&E
Richard Rider, Atl
Al Paulin

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 11/3/86

BY: Russ Sydnor

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: Gary Schulz

COMPANY: GE, Burlington, Iowa

SUBJECT: Testing of FFA from GE TCB.

NOTES:

Gary called to inform me that they had not been able to duplicate the problem with closing springs falling off. Therefore, they felt that any additional testing on this particular FFA was futile. He stated they would be happy to inspect & test breakers that have the problem in the future. He will arrange with GE in King of Prussia to supply us with a replacement FFA. They will keep the FFA they now have.

COPIES TO:

File

(M-2374.

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 10/29/86

BY: Russ Sydnor

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: Richard Rider

COMPANY: General Electric

SUBJECT: Rx Trip Breaker, Front Frame Assembly testing

NOTES:

Richard called to let me know that the Front Frame Assembly I had sent him for failure Analysis was being sent to GE's new Facility in Burlington Iowa for further testing. Testing to date has not been able to determine cause of closing springs falling off And in fact has not even been able to duplicate the failure (i.e. make the springs fall off.) Burlington plans to use High speed photography to monitor spring action on breaker cycling.

COPIES TO:

File

JMM/JRO/DPB

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 9/8/10

BY: Russ Sydnor

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL [X] CONFERENCE [ ]

WITH: Richard Ryder,

COMPANY: GE, Atlanta Service Shop.

SUBJECT: TCB, FFA testing.

NOTES:

GE could not make operating springs fall off the FFA we sent them for testing. They tried numerous situations including High D.C. voltage condition breaker was cycled 50-60 times And springs did not fall off.

FFA was disassembled And inspected in detail. All was OK per Rein prints.

COPIES TO:

File.

BALTIMORE
GAS AND
ELECTRIC

CHARLES CENTER • P.O. BOX 1475 • BALTIMORE, MARYLAND 21203

NUCLEAR ENGINEERING SERVICES DEPARTMENT
CALVERT CLIFFS NUCLEAR POWER PLANT
LUSBY, MARYLAND 20657

August 26, 1986

Mr. George Sanders
Nuclear Plant Services
General Electric Company
1000 First Avenue
King of Prussia, Pennsylvania 19406

Dear Mr. Sanders:

This letter is to inform you of the third occurrence in 1986 of a problem with our refurbished (new Front Frame Assemblies) GE AK-2A-25 breakers. The problem involves closing springs randomly coming loose during breaker operation. When these springs come off, the main contacts do not make up even though the breaker indicates closed. In January of this year this problem caused a Reactor Trip on our Unit 1. There have been two other occurrences since January. One in March occurred on the same breaker as in January "after" the breaker had been inspected and repaired by GE's Atlanta Service Shop. The third occurrence was on August 18, 1986 on a different breaker in our Unit 2. I have become aware that other utilities have experienced similar problems.

I am requesting your assistance in expediting the detailed inspection of the Front Frame Assembly that exhibits this problem which we sent to your Atlanta Service Shop earlier this year. Additionally, I am requesting your assistance in determining a field modification or repair to resolve this problem. Perhaps a better method of securing the closing springs in place.

Thank you for your assistance. You can contact me at (301) 260-4953 if you need further details.

Sincerely,

R. B. Sydnor

Russell B. Sydnor
Primary Systems Engineering Unit

RBS/klb

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 8/20/86

BY: Russ Sydnor

PURCHASE ORDER NO. —

REQN. NO. —

SOR NO. —

TELEPHONE CALL ☒ CONFERENCE ☐

WITH: George Sanders, General Electric Nuc. Srvs.

COMPANY: GE

SUBJECT:

NOTES: Called George to inform him of closing spring problem on U-2 TCO #2. Requested his assistance in resolving this problem, possible field mod to better retain the springs, and to try to have Atlanta service shop complete testing/investigation of Front Frame Assembly we had sent them earlier in 86 that had exhibited this same problem. (FFA was taken off U-1 TCO #2) Atlanta shop has the FFA but has not looked at it yet.

I will be sending a formal letter to GE documenting the recurrence of this problem and requesting their assistance in resolving it.

In phone conversation with Atlanta Service shop found out Arkansas has experienced similar problem. I will be contacting them to discuss their corrective actions and experience with this problem.

COPIES TO:

CR Mahon

JM Molina/JR Dunn

K.R Riggleman

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY . . . . . 5035 PEACHTREE INDUSTRIAL BOULEVARD
CHAMBLEE (ATLANTA), GEORGIA 30341
Phone (404) 452-4800 . . . . . NIGHTS, SUNDAYS AND HOLIDAYS 452-4800

APPARATUS AND
ENGINEERING SERVICES
OPERATIONS

ATLANTA APPARATUS
SERVICE SHOP

February 27, 1986

Baltimore Gas & Electric
Calvert Cliffs Nuclear Plant
Lusby, Maryland 20657

Attn: Russ Sydnor

Re: Component Malfunction Form #S-044
Breaker S/N 228A3189-200

Dear Mr. Sydnor:

Upon receipt inspection of the above referenced circuit breaker, one of the two closing springs was found loose and lying in the bottom of the front frame assembly. Closer inspection of the closing mechanism revealed a loose latch shaft and the second closing spring was not installed according to assembly drawings.

The closing mechanism was disassembled and a new latch roller assembly was installed. The breaker was then reassembled and the closing springs reinstalled as found on initial inspection. Electrical closing tests were then performed with no problems resulting.

The closing springs were then removed and reinstalled as specified on the assembly drawings. Electrical closing tests again were perf med with no failures.

A complete calibration and test was performed on the breaker to determine contact wipe, stationary contact spring pressure, trip shaft trip, etc. with all test results falling within factory specifications.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY . . . . . 5035 PEACHTREE INDUSTRIAL BOULEVARD
CHAMBLEE (ATLANTA), GEORGIA 30341
Phone (404) 452-4800 . . . . . NIGHTS, SUNDAYS AND HOLIDAYS 452-4800

APPARATUS AND
ENGINEERING SERVICES
OPERATIONS

ATLANTA APPARATUS
SERVICE SHOP

February 27, 1986

Based on our findings, we cannot determine any conclusive cause for the closing spring to have come off its supports. However, the loss of a closing spring could result in the failure of the mechanism and contacts to close properly.

If any further information is required, please contact me.

Yours truly,

Richard Rider
FIELD REPRESENTATIVE
NUCLEAR PLANT SERVICES

M-2374-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 1/24/86

BY: Russ Sydnor

PURCHASE ORDER NO. —

REQN. NO. —

SOR NO. —

TELEPHONE CALL ☒ CONFERENCE ☐

WITH: Todd Byrum

COMPANY: G.E.

SUBJECT: Reactor Trip Breaker (AK-2-25) failure on 1/23/86

NOTES:

1. Informed Todd of the failure and what we had found, i.e. operating spring had fallen off for unknown reason.

2. Asked his assistance in arranging for GE to evaluate failure & repair the breaker.

3. He promised to arrange for repair work. Most likely will be at Atlanta service shop.

4. Todd will call me back with address, contact, other info for shipment of breaker.

5. Work may be under WARRANTY.

COPIES TO:

Sys 58 File:

JMM/DRB/JRD F.Y.I.

SUBJECT: Failure of GE AK-2-25 Reactor Trip Breaker, Update to NCTWORK Entry #OE-1622

UNIT:..... Calvert Cliffs Unit COMMCIN

DOCKET NO./LER NO.:..... N/A

EVENT DATE:..... Various

NSSS/A-E:..... C-E/Bechtel

RATING:..... 860 MW(e)

DATE OF COMMERCIAL OPERATION:..... 317: 05/08/75
318: 04/01/77

SUPPLEMENTAL DESCRIPTION:

2 Loop Combustion Ensineering PWR

EVENT DESCRIPTION:

In January, 1986, Calvert Cliffs Unit 1 tripped during monthly RPS Surveillance Testing. The cause of the trip was a mechanical failure of a trip circuit breaker. The breaker was found to have one of its two mechanism operating springs (or closing springs) loose and lying in the bottom of the front frame assembly. The breaker was returned to General Electric for repair and testing. General Electric could not determine the exact reason the spring came loose, but did determine that the remaining spring was not installed according to assembly drawings. Further investigation revealed that all front frame assemblies purchased from General Electric and delivered to Calvert Cliffs in 1983, 1984, and 1985, had their operating springs (closing springs) installed incorrectly. According to assembly drawings, these springs are required to be installed with a specific orientation. A General Electric representative came onsite on 3/11/86, and corrected all spring installations on installed breakers and stock front frame assemblies.

General Electric repaired and returned the failed breaker, but it failed again upon reinstallation on 3/23/86. General Electric came onsite again on 3/27/86, but could not determine the cause of the second failure. The breaker's front frame assembly was replaced with a new assembly and the old assembly will be returned to General Electric for further testing.

Information Contact: RUSS SYDNOR AT (301) 260-4953.