Enclosure 1

[illegible] ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

September 15, 1983

MEMORANDUM FOR: Senior Resident Inspectors (Projects Branch 2)

FROM: C. E. Norelius, Director, Division of Project and Resident Programs

SUBJECT: INFORMATION REQUEST ON LICENSEE RESPONSE TO INFORMATION NOTICE NO. 82-13 "FAILURES OF GENERAL ELECTRIC TYPE HFA RELAYS"

Recent failures of the relays described in Information Notice No. 82-13 at Duane Arnold are such that one APRM channel in the Reactor Protection System failed to respond during a surveillance test. The recommendations in Information Notice 82-13 to replace the HFA relays had not been performed by the licensee because of the unavailability of the HFA Century Series Relay or the Century Series TEFZEL coil spools. It appears that the real problem with these relays is that they are only designed for a lifetime of 10 to 14 years in applications similar to that for which they are being used at nuclear facilities. Many of the licensed facilities now approach or exceed this time period (considering the preoperational testing phase of the facility). Simultaneous failure of these HFA relays represents a potential for an ATWS. We are, therefore, asking you to obtain information from the licensee regarding their action with respect to Information Notice 82-13. Particularly, we would like to know if the licensee has replaced all normally energized AC excited HFA Relays that are in Class IE Engineered Safeguards System circuits, particularly those in the Reactor Protection System circuits. The failures appear to be more predominant in normally energized AC excited circuits. If these relays have not been replaced, we would like to know what schedules the licensees have for replacement, upgraded surveillances, etc. You should be aware and make the licensee aware that the General Electric Service Advice letter referenced in Information Notice 82-13 (GE SAL PSM 152.1) is in error. The correct General Electric Service Advice letter is SAL PSM 152.2 and the licensee should review this particular SAL.

Please provide this information to your Section Chief (via telephone or facsimile) by COB September 16, 1983.

C. E. Norelius, Director
Division of Project and Resident Programs

cc: W. D. Shafer
D. C. Boyd
I. N. Jackiw
R. D. Walker
M. Jordan

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Enclosure 2

S.A. 721 - PSM - 152.2

In line with our policy of informing users of possible problems with our products, the following information applies to type HFA relays.

In April 1976, Service Advice 721-PSM-152.1 was issued which described problems involving HFA relays. This communication discussed a report from a customer of cracked black Lexan coil spools. This problem was traced to improper mixing of black Lexan by the vendor.

Recently we have received two reports of HFA relays with cracked clear Lexan coil spools. These relays were manufactured in 1975. On this basis, the earlier Service Advice, copy attached, is amended to include clear Lexan spools. We recommend, as described in Service Advice 721-PSM-152.1, that HFA coil spools be checked during your normal inspection of the relay. A cracked coil spool could result in a broken piece which could prevent desired contact action in responcse to energization or de-energization of the relay.

Except for Class 1-E nuclear applications, standard replacement magnetic assemblies (coil, laminations and shading ring, when used), will be furnished. Current standard design uses Tefzel spools and formex coated wire. If requested, long-life Century Series magnetic assemblies with Tefzel spools, high temperature wire and impregnated insulation can be supplied at added cost.

The spool material has been changed and all coils wound for the HFA relay

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Q.C. Acceptance
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For Class 1-E nuclear installations, replacement should be made by applying a Century Series HFA relay of equivalent function. The Century Series family of relays has been qualified for class 1-E nuclear application per IEEE 323 - 1974.

This problem has been reported to the NRC by General Electric Co.

If you wish a standard magnetic assembly replacement, a purchase order should be forwarded to this office specifying the model number of your relay and its coil voltage. In the event that you want a Century Series magnetic assembly replacement, include that information on your purchase order.

If you want a Century Series HFA, which is the only option for class 1-E nuclear application, your purchase order should specify the model number of the Century Series relay and coil voltage. General Electric Handbook sections 7210, 7211, 7212 and 7292 describe ordering, prices and relay descriptions of the various HFA models.

In response to this Service Advice, the price for a ~~coil~~ replacement kit or Century Series replacement relay will be 50% of the handbook price. This special price offer will expire May 1, 1982.

Enclosure 3

To: Wolfgang Lauden
Washington, D.C.
301-492-8187

S.A. 721 - PSM - 152.2A

In late 1980 Service Advice 721 - PSM - 152.2 was issued advising of possible cracking of Lexan coil spools used in HFA relays. It stated that a cracked coil spool could result in a broken piece preventing the desired contact action in response to energization or de-energization of the relay.

It has been brough to our attention recently that this condition has actually taken place in field applications. We would emphasize again, as described in Service Advice 721 - PSM - 152.1, that HFA coil spools be checked during your normal inspection of the relay.

For class 1-E nuclear installations, replacement should be made by applying a Century Series HFA relay of equivalent function. The Century Series family of relays has been qualified for Class 1-E nuclear application per IEEE 323-1974.

Attached you will find a copy of Service Advice 721 - PSM - 152.1 and 152.2 detailing actions to be taken. The 50% of handbook price for a replacement kit or Century Series replacement relay will be extended until May 1, 1983.

If you have any further questions or need assistance please contact the undersigned.

Further information can be obtained from
John C. Dyckman
Philadelphia, Pa.
8*245-3759 or 215-726-3759

GENERAL ELECTRIC HFA RELAY PROBLEMS

BACKGROUND

- HFA IN USE IN SAFETY SYSTEMS AT ALL BWRs AND SOME PWRs
- FAILURES TO DROP-OUT WHEN DEENERGIZED HAVE BEEN REPORTED SINCE 1970
- MANUFACTURER HAS TAKEN CORRECTIVE ACTION TO RESOLVE PROBLEMS AS THEY AROSE - RECOMMENDED REPLACEMENT
- STAFF HAS TAKEN CORRECTIVE ACTION TO RESOLVE PROBLEMS AS THEY AROSE

CURRENT STATUS

- FAILURES REPORTED AT DUANE ARNOLD AND PILGRIM
- REGION III PLANS TO ISSUE CONFIRMATORY ACTION LETTER (CAL) TO DUANE ARNOLD
- REGION III IS CURRENTLY SURVEYING ALL OR's TO DETERMINE STATUS OF REPLACEMENT PROGRAM
- IE HAS REQUESTED SIMILAR INFORMATION FROM REMAINING OR's THROUGH REGIONS
- FINDINGS OF SURVEYS WILL BE USED TO DETERMINE APPROPRIATE ACTION

Geary

SSINS No.: 6835
IN 82-13

Ref. 5

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

May 10, 1982

IE INFORMATION NOTICE NO. 82-13: FAILURES OF GENERAL ELECTRIC TYPE HFA RELAYS

Addressees:

All holders of a nuclear power reactor operating license (OL) or construction permit (CP).

Purpose:

This information notice is provided as an early notification of a potentially significant problem pertaining to General Electric type HFA relays with LEXAN or NYLON coil spools in safety related systems. It is expected that addressees will review the information for applicability to their facilities. No specific action or response is required at this time.

Description of Circumstances:

NRC IE Information Notice 81-01, dated January 16, 1981, alerted licensees and holders of construction permits of LEXAN coil spool surface cracking. General Electric Service Information Letter (SIL) No. 44 Supplement 2 dated February 1981 directed to all boiling water reactor (BWR) owners and General Electric Service Advice PSM 152.1 dated April 28, 1976 directed to all General Electric (GE) customers advised them of the coil cracking problem and recommended replacing cracked LEXAN and NYLON coil spools with new Century Series "TEFZEL" coil spools or replacement of the entire relay with a HFA Century Series relay.

Recently, in addition to the previously identified cracking problem, there have been several instances of melting of LEXAN and NYLON coil spool material. The licensee reports listed below are some reported instances of melting in HFA relays:

1. Monticello - Northern States Power Company reported on November 6, 1981 that during cold shutdown, a GE type 12HFA 51A49F relay pertaining to primary containment isolation system logic circuit failed to open when deenergized.

   Follow-up investigation indicated that partial melting of the NYLON coil spool prevented the relay from moving to the deenergized position for several minutes after the coil was deenergized. Several switches in series with the relay coil circuit were burned-out and had to be replaced.

2. Millstone 1 - Northeast Nuclear Energy Company reported on February 24, 1982 that during a routine surveillance one GE type HFA relay associated with the containment isolation logic circuit stayed in the energized position when deenergized. As discussed below, melted LEXAN material

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was found to be the cause. The relay deenergizes to cause main steam isolation valve closure on main steamline high radiation. The logic requires one of two channels in each of two trip systems to deenergize and cause the isolation. The other three channels were operable, therefore, an actual high main steamline radiation level would have resulted in valve closure.

3. Brunswick 2 - Carolina Power & Light Company reported on February 4, 1982 that during the functional performance test of the primary containment isolation system main steamline high flow channel it was discovered that the main steamline high-flow channel "C" logic would not actuate. The details of this failure are somewhat different than the failures observed at Monticello and Millstone 1. In Brunswick 2, the armature apparently did move to the deenergized position. However, melted insulation from the relay coil of the actuation relay GE Model 12HFA 51A49F had coated the relay contacts, preventing electrical contact. Like the Millstone 1 event, the remaining main steamline high flow channels "A", "B" and "D" were operable and would have initiated isolation upon an actual high flow condition.

During earlier surveillance and coil replacement programs, testing did not identify a failure in the mechanism which would prevent the relay contacts from opening. Subsequent evaluation of the Millstone 1 relay by GE Power Systems Management Business Department in Philadelphia, led to the following analysis: A piece of the spool flange fell into the gap between the open armature and pole face. When the relay was energized the armature attempted to close but was prevented from sealing against the pole face due to the piece of spool flange in the air gap. At this point the contacts could have been just touching. This created a fixed air gap in the magnetic circuit. The increase in the current caused by an air gap produced an excessive temperature rise in the coil. This excessive temperature rise, thru conduction and convection to the armature assembly and shading ring and eventually the piece of spool flange caused the loose piece of spool flange and remaining spool flange to soften, melt and move. As the piece of spool flange in the gap melted, the air gap closed permitting the normally open contacts to fully close. In addition, the closure of the gap reduced the current to normal. This reduction in current caused a lower temperature and melted LEXAN then hardened and created a bond between the armature and the pole face. Thus, when the coil was deenergized the return spring force was not enough to break this bond. Subsequent testing of the coil shows that the coil is in normal operating condition (no shorted turns).

Although the examples cited above relate to BWRs, the GE type HFA relays are also commonly used in the safety system logic circuits of pressurized water reactors (PWRs). The above information identifies means whereby the function of a major safety-related system can be jeopardized or compromised by relay malfunctions.

GE has notified its BWR and PWR customers of its findings and has reiterated the need for periodic visual inspections. In addition, GE has also amplified its earlier recommendations. In the event that cracked spools or evidence of overheating is observed, GE recommends that either the entire

relay be replaced with a HFA Century Series relay or that the LEXAN or NYLON coil spool be replaced with Century Series TEFZEL coil spools.

If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office, or this office.

Sincerely,

Edward L. Jordan, Director
Division of Engineering and
Quality Assurance
Office of Inspection and Enforcement

Technical Contact: W. Laudan
301-492-4766

Attachment:
Recently Issued IE Information Notices

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

[redacted] 2 1 99999
[redacted] LICENSNG
[redacted] REACTOR ASSESSMENT
[redacted] DC 20555