

Attn: NRC Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC
20555-0001
USA

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NRR

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March 19th, 2021

U.S. Nuclear Regulatory Commission Document Control Desk
Washington, DC 20555-0001

Attention : Document Control Desk

Subject: Final Report of Notification of Potential Defect – 10 CFR Part 21

Reference: Potential Defect of Basic Components (A070) controller boards of Gutor
UPS systems

To Whom It May Concern:

On February 12, 2021, Gutor Electronic LLC (“Gutor”) notified the NRC Operations Center by facsimile of a reportable occurrence under Title 10 of the Code of Federal Regulations (“10CFR”), Part 21, involving an Uninterruptible Power Supply (“UPS”) behavior that could potentially cause an unintentional shutdown of the UPS, manufactured and supplied by Gutor.

The following information is provided in compliance with the notification requirements of §10CFR21.21(d)(3)(ii) and (d)(4):

i) Name and address of the person informing the Commission:

Marne Schu
Gutor Customer Satisfaction & Quality Director
Gutor Electronic LLC
Hardstrasse 74
5430 Wettingen
Switzerland

ii) Identification of basic component which contains the defect:

The potential defect is contained on the safety related Printed Circuit Board ("PCB") A070 controller of Gutor UPS systems.

The main tasks of the A070 PCB controller are the followings:

- Controlling the rectifier
- Controlling the static switches
- Controlling the inverter
- Monitoring voltage, current, alarms
- Communication with the front panel

The controller contains a firmware-controlled Master Processing Unit ("MPU"), a central component of the A070 PCB controller that connects to almost any other circuits on the board. This MPU microcontroller chip is mated in the controller board with a Plastic Leaded Chip Carrier ("PLCC") socket.

iii) Identification of the firm supplying the basic component:

The A070 PCB controller is designed, manufactured, and supplied by:

Schneider Electric P1F
Administration Building
Lot1, Block5, Phase 2
PEZA Rosario Cavite
Philippines

The PLCC socket is designed, manufactured, and supplied by:

Ho Chien Connectors International
Co No 21 L104 An xiang Rd
Xindian Dist
New Taipei City
Taiwan 231

The Intel MPU chip is stored and supplied by:

HTV Conservation GmbH
Robert-Bosch-Str.28
D-64625 Bensheim
Germany

iv) Nature of the defect and the safety hazard which is created by the defect:

The potential defect is contained on the MPU chip mated with its PLCC socket.

The Master Processing Unit (MPU) with associated peripherals is essential for the overall main controller board functionality. An intentional (pressing RESET-button) or unintentional (hardware/firmware related) actuation will immediately halt the main function leading to a loss of the inverter output voltage (not considering separate Independent Static Bypass Switch ("ISBS") which shall transfer to bypass supply if available).

Besides a manual RESET, the following causes can initiate a critical RESET-cycle of the MPU microcontroller:

- MPU microcontroller related and internally created Reset Instruction caused by corrupted RAM / ROM memory data, or
- disturbance to Address- and Data-bus due to component failure or contact issues affecting single or multiple contributing electrical connections.

Further to Gutor Root Cause Analysis investigation, the MPU reset condition was caused by the microcontroller internal protection mechanism.

An erratic contact integrity for the MPU chip to the associated socket caused by dissolved organic residues (white stains) present in and around the contact areas which may have already been affected by other aging effects finally caused the disfunction.

The Identified root cause can be seen in a non-compliant socket quality mated with aged MPU chips whose contact surfaces may show irregularities.

The MPU chip and associated PLCC socket contact integrity and cleanness analysis clearly showed that critical deficiencies might be present, albeit they cannot be revealed by a simple optical-site inspection. There is no distinct proof that undetected particles or mold irregularities may not impair correct contact force over time. Remaining white stains on contact springs may further dissolve with temperature and form the critical "white film" penetrating non-tight contact areas.

These processes seem to evolve over time (days to multiple months) but cannot be stopped with the actual plugged design with aged microcontroller's contacts, even if

conserved in a nitrogen environment prior to population at the board manufacturer's plant.

Some chip pins showed organic deposits, indentations, and tin-oxidation already when taken from the stock conservation environment. Even an improved socket design may not compensate these issues.

v) Date on which the information was obtained:

On January 19th, 2021, an independent Schneider Electric laboratory reported to Gutor that the PLCC socket of non-compliant quality was mated with aged Micro Processor Unit (MPU) chips installed on the (A070) controller boards of the Class 1E UPS.

vi) Locations affected by the reported condition:

Table 1 (attached) lists the sites that operate with safety related A070 PCB controller of Class 1E UPS where 10 CFR Part 21 applies.

vii) Name of the implementing organization and time frame for implementing the corrective actions:

Intermediate Upgrade with soldered MPU design

Most observations related to white stains on electrical contacts and affected pin surfaces are attributed to the MPU chip / socket assembly. Its circuit integrity is vital for a secured operation.

Gutor developed a soldered MPU chip assembly for another board generation where the same Intel 80C196 microcontroller is reflow-soldered onto an adapter PCB that is connected to the controller base PCB by soldered pins (comparable to PLCC socket connecting pins).

This upgrade option might be considered for the controller boards of the site inverter units. However proper de-soldering of the PLCC sockets (68-pinner on a multilayer PCB) can only be done by a specialized and Gutor known certified company in Switzerland. They are also equipped with an X-ray unit capable for post inspection.

Such an upgrade is however not considered as a full lifetime solution bearing in mind that not all remaining potential degradation effects related to other still plugged devices are addressed. Gutor therefore only recommends it as an intermediate solution.

Upgrade to new Controller Generation

The inverter controller boards used for this scope of delivery are becoming obsolete because of single source components which are no longer available and where suitable substitution components do not exist at all.

Gutor has developed a new generation of UPS (Inverter and Rectifier) controllers called "Blackbird". They have been introduced for non-nuclear applications in 2014 and the latest evolution is now about to complete the demanding and stringent qualifications for Class 1E usage. Gutor is therefore proposing an upgrade to this level (backwards compatibility is secured).

viii) Advice related to the defect that will be given to the purchasers:

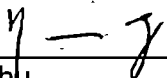
Due to the multiple factors noticed during the RCA investigation, Gutor is currently not able to evaluate if this potential failure on the A070 PCB controller could cause a substantial safety hazard at the impacted nuclear power plants.

In this concern, Gutor will contact within five (5) working days from issuance of this letter, the concerned Purchasers listed in Table 1.

If you have any questions or need additional information concerning this report, please do not hesitate to contact the undersigned at (41)-79-417-2803 or marne.schu@se.com.

On behalf of Gutor Electronic LLC, I remain at your disposal for any further clarifications.

Yours sincerely,



Marne Schu
Gutor Customer Satisfaction & Quality Director

Table 1: List of Affected Safety Related A070 PCB Controllers within the United States

Nuclear Power Plant	Purchaser	Gutor UPS system serial number	A070 Controller board part number	A070 Controller board ID reference
J.A Fitzpatrick	Exelon Fitzpatrick LLC	Spare part for systems 1090334001, -002 & -003	0P2447-001	ID00039148
J.A Fitzpatrick	Exelon Fitzpatrick LLC	Spare part for systems 1090334001, -002 & -003	0P2447-001	ID00065507
VC Summer 1	Dominion Energy South Carolina	1170067001	0P2446-001	ID00062821
VC Summer 1	Dominion Energy South Carolina	1170067002	0P2446-001	ID00062822
VC Summer 1	Dominion Energy South Carolina	1170067003	0P2446-001	ID00062823
VC Summer 1	Dominion Energy South Carolina	1170067004	0P2446-001	ID00063398
VC Summer 1	Dominion Energy South Carolina	1170067005	0P2446-001	ID00062281
VC Summer 1	Dominion Energy South Carolina	Spare part for systems 117006700x	0P2446-001	ID00063340