Brown Boveri

Switchgear Products Group

BBC
BROWN BOVERI

BBC Brown Boveri, Inc.
4379 County Line Road
Chalfont, PA 18914
Fax (215) 822 4270
Telex (215) 822-4271

December 23, 1987

Mr. William T. Russell
Regional Administrator
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Gentlemen:

Enclosed is a copy of a 10CFR Part 21 Report filed with your office in Washington, D.C. On the advice received from the NRC in Washington on December 22, 1987, the report was addressed to Mr. Carl Berlinger. Subsequently, on December 23, 1987 we were advised to address any future Part 21 reports to your attention in Region I.

Our office will be closed from December 24, 1987 through January 4, 1988. If you have any questions, you may reach me at home (215) 265-0699.

E. W. RHOADS
Manager Quality Assurance

EWR/jm

Enclosure

IE19
1/1

Brown Boveri

Switchgear Products Group

BBC Brown Boveri, Inc.
Six Sentry Parkway
630 Sentry Park
Blue Bell, PA 19422
Phone (215) 834-7400

December 22, 1987

Mr. Carl Berlinger, Branch Chief,
Generic Communications
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Part 21 Report
27N Undervoltage Relay Only
With Harmonic Filter Option
(Catalog No. 211T4175-HF)

Dear Mr. Berlinger:

An LER (87-023) issued by Philadelphia Electric Limerick Unit #1 describes an RPS (Reactor Protective System) breaker trip that was caused by a spurious undervoltage relay trip signal.

A subsequent investigation by BBC Brown Boveri into this false trip signal experienced with the 27N Undervoltage Relay (Catalog #211T4175-HF) indicates that the misoperation occurred on the energized switchgear when the control voltage was reapplied after having been off for a period of time.

Under these conditions, with 120 VAC input and no control voltage, a small low level voltage is coupled into the relay's internal circuits through an input protection circuit. This circuit consists of two diodes, D1 and D2, which are connected from a gate of input op-amp, U1, to the plus and minus 15 volt reference buses in order to protect U1 from any possible overvoltages. Hence they are normally reverse biased and in an off state. When there is no control voltage present, the gate of U1 is not stablized to its normal condition of 0 volts, and can rise a few volts. This allows D1 and D2 to couple a small amount of the input AC signal into the reference buses, which then rise to a few tenth's of a volt. This level is just enough to partially energize some of the inputs to some IC's, which may cause them to be in an indeterminate state. Now when the control voltage is restored, the circuit may not be able to follow the normal, orderly power-up designed into the relay. When the condition occurs, a false trip signal is generated about 30 msec after the control voltage is restored, persists for about 30 msec and then clears.

This condition occurs only in the 27N undervoltage relay model when the Harmonic Filter option is installed. Models without this option have a fast settling time which overrides any indeterminate state conditions.

A review of the input circuit showed that the protective diodes could be re-connected to by-pass excess input levels to the zero bus and give equal or better protection and yet not change the calibration or operation of the relay in any way. This change eliminates the coupling path and allows the circuit to always power-up from 0 volts as intended.

~~8841130078~~
(390)

Other 27N undervoltage relay[illegible]ith the Harmonic Filter option) which have been supplied for Nuclear Safety Related applications are included in the attached list. The users have already been notified about the potential for misoperation when control voltage has been removed and then reapplied to energized switchgear. Users of the 27N undervoltage relay without the Harmonic Filter option will also receive a copy of this report for their information.

Modifications can be accomplished in the field by qualified electronics technicians using parts and instructions furnished by BBC Brown Boveri or the relays may be returned to the factory.

J. H. Hurtsman for
A. F. Kaiser

A. F. KAISER, President
Switchgear Products Group

EWR/jm

Attachment

BBC

27 N Relays Supplied with Harmonic Filters

Cat. #211T4175-HF

BBC SO #	Utility and Plant	PO	QTY	SN's
52891	Mississippi Power and Light Grand Gulf	GG10674	4	1368 thru 1371
53978	Mississippi Power and Light Grand Gulf	GG11245	1	1378
54525	Philadelphia Electric Co. Limerick	527741 (Tulsa)	2	1390, 1391
55009	Philadelphia Electric Co. Peach Bottom	EE276320	14	1412 thru 1425
55048	Philadelphia Electric Co. Limerick	3709584	4	1426 thru 1429
11184	Philadelphia Electric Co. Limerick	18250F-00426	4	1256 thru 1259