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CONTROL NO: 2176

FROM: Niagara Mohawk Power Corp Lycoming, N.Y. 13093 P. A. Burt	DATE OF DOC: 4-18-72	DATE REC'D 4-21-72	LTR x	MEMO	RPT	OTHER
TO: D. J. Skovholt	ORIG 1 signed	CC	OTHER	SENT AEC PDR x SENT LOCAL PDR x		
CLASS: (U) / PROP INFO	INPUT	NO CYS REC'D 1		DOCKET NO: 50-220		

DESCRIPTION:
Ltr reporting an incident...re tripped off-line as a result of a malfunction in a continuous power supply on 2-28-72 at 13:32 hrs

ENCLOSURES:

FOR ACTION 4-22-72 fod

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NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

Nine Mile Point Nuclear Station
Unit #1
Post Office Box 32
Lycoming, New York 13093

April 18, 1972

Regulatory File Cy.

RECEIVED
APR 21 1972
U.S. ATOMIC ENERGY COMMISSION
Regulatory Mail Section

Mr. Donald J. Skovholt
Assistant Director for Reactor Operations
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Skovholt:

Re: Provisional Operating License DPR-17
Docket No. 50-220

On February 28, 1972 at 13:32, the Nine Mile Point Nuclear Station, Unit #1 tripped off line as a result of a malfunction in a continuous power supply.

Initial Operating Condition

Steady state operation

MWth - 1760 Reactor pressure - 1011 psi

MWe - 609 (gross) Steam flow - 6.25 X 10^6 lbs. per hr.

Introduction

Prior to the trip, the Station was operating at a steady state output. A reactor protection system continuous power supply motor generator set malfunctioned causing loss of electrical power to half of the reactor protection system and part of the feedwater control system. The malfunction caused a feedwater upset and a reactor low water level scram. Following the scram, the water level increased and spilled into the main steam lines.

Sequence of Events

At 13:31:31 low output voltage alarm 162 M/G set

13:31:43 All sensors in channel 11 reactor protection system tripped. (Fail safe on loss of voltage.)

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Sequence of Events (cont'd)

13:31	loss of feedwater control and feedwater valve lockup due to loss of the M/G set.
13:31	Clean Up system isolated
13:31:45 (approx)	Reactor scram due to low level trips
13:32	Main Steam isolation valves closed, reactor pressure less than 850 psi in run mode.
13:34:43	M/G set auto transferred back to AC drive.
13:40	Unsuccessful attempts to restore Clean Up system
13:41:15	M/G set transferred to DC drive again, loss of continuous power supply voltage.
13:43:23	Reactor level +3 ft. above minimum normal water level.
13:44:32	#111 electromagnetic relief valve open (Note - closing time may not be monitored after five seconds.)
13:44:32	#112 electromagnetic relief valve open.
13:44:34	M/G set auto transferred back to AC drive.
13:44:36	#112 electromagnetic relief valve closed.
13:46:29	#121 relief valve open
13:46:57	#111 relief valve open
13:46:57	#112 relief valve open
13:47:02	#121 relief valve closed
13:47:02	#112 relief valve closed
13:47-14:14	Repeated relief valve operation
13:50	Clean Up System restored to service
14:14	Reactor level and pressure under manual control. Reactor level below emergency condenser nozzles.
14:14-14:24	Operating relief valve to reduce pressure
14:24	Emergency condenser placed in service manually.

Analysis of the Trip

All of the sensors in channel 11 reactor protection system tripped causing a 1/2 scram due to the fail safe design of the system on loss of power. The loss of power to parts of the feedwater system caused a feedwater upset, control valve lockup and subsequent reactor scram due to low water level.

The reactor protection system M/G sets are equipped with monitoring devices on the AC motor drive power which causes a transfer to DC motor drive from the station battery when the AC power source is outside specified limits. The input under-frequency monitor caused the transfer just prior to the scram. The transfer trips the AC supply to the motor drive and closes the contactor for the DC motor drive. Transfer to DC drive did not occur causing the M/G set to coast down. This resulted in loss of generator output voltage to the reactor protection system channel 11, parts of the feedwater control system and the clean up system.

The M/G set should have returned to normal AC drive after a two minute delay, restoring the generator output voltage as part of an automatic operation. This occurs because the AC power to drive the M/G set is monitored after a transfer to DC drive and allows a transfer to normal if the AC power has been within specified limits for two minutes. Analysis of the data shows that the M/G set did transfer to AC drive after two minutes, but transferred a second time to DC drive resulting in coast down and loss of power for two minutes.

The feedwater system was operating with the turbine shaft pump and two electric motor driven pumps in service at the time of the trip. The control valves on all pumps locked up on loss of the M/G set output. The output of the MG set also supplies some of the control modules in the feedwater control system. The nature of the power failure has made it impossible to determine at what position the feedwater valves locked up. Loss of the ability to control feedwater flow after the scram caused increase reactor water level and the overflow of water into the main steam lines. Several conditions prevail after the scram which made the control of water level difficult. The main steam isolation valves closed. The clean up system isolated which is the only system through which water can be removed from the reactor. The control rod drive system delivers 65 gpm to the reactor continuously, from a source outside the reactor.

Analysis of data indicates that water overflowed into the main steam lines at about 13 minutes after the scram. The long time suggests that feedwater flow was at some low flow value.

The clean up system provides the only means for removing water from the reactor following a scram. This system isolated at the time of the trip because sensors are powered from the malfunctioned M/G set. Several attempts were made to restore this system after the scram. It was successfully returned to service about 20 minutes after the scram.

Analysis of the Trip (cont'd)

The relief valves operated at approximately 13 minutes after the scram, and then repeated several operations for the next 30 minutes at which time water level was brought under control. After water level was under control the emergency condenser was placed in service to assist in holding pressure.

Cause of the Malfunction

The transfer of the M/G set drive from AC to DC drive motor was caused by an under-frequency monitor. This device is adjusted for a 59.75 HZ transfer with a 70 millisecond time delay. The short time delay makes the device sensitive to transient electrical noise resulting in unnecessary transfers. This action by itself was not the cause of the malfunction. The malfunction was caused by a blown fuse in the control circuit for the DC drive.

A 6 amp fuse was installed in place of a 10 amp fuse. The fuse stamping was very difficult to read and was the reason for the installation of the wrong size fuse. No electrical problems could be found with the control circuits. The fuse was replaced and transfer tests were performed to test the control circuits.

Problems with the feedwater control and clean up systems which resulted in high water level were caused by the M/G set malfunction, which in turn, caused these systems to become inoperable or uncontrollable.

Corrective Action

The time delay of the under-frequency relay has been changed from 70 milliseconds to 110 milliseconds. This adjustment makes the device insensitive to electrical noise thus preventing unnecessary transfers. The fuses in all the M/G sets were checked to insure proper sizes are installed. Surveillance of M/G set control panels will indicate a blown fuse and loss of the transfer control circuit.

The feedwater lockup circuits will be rewired so that all the circuits are not powered from the same M/G set. This will provide manual flow control on at least one motor pump on loss of power.

Conclusion

The malfunction was caused by a blown fuse in the transfer control circuit of a continuous M/G set power supply. The wrong size fuse was installed in the control circuit. This caused the M/G set to coast down and the loss of generator output voltage resulted in a feedwater upset and a reactor scram. The wrong size fuse was initially installed because the fuse stamping was misleading.

Conclusions (cont'd)

Increased surveillance of the M/G sets will afford early detection of control circuit problems and decrease the chance of a malfunction of a continuous power supply.

Very truly yours,

P. Allister Burt

P. A. Burt
General Superintendent,
Nuclear Generation