NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

Nine Mile Point Nuclear Station
P. O. Box 32
Lycoming, New York 13093
December 5, 1970

Dr. Peter A. Morris, Director
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Morris:

Re: Docket Number 50-220
Provisional Operating License DPR-17

We have been requested by the Compliance Section to report electrical output oscillations on the Nine Mile Point generator when approaching 510 MW(e) gross output. Tests are in progress to identify the origin of the problem which could be one or a combination of the following:

1. Liquid being drained from moisture separators and reheaters is saturated. The extraction heaters to which it is ultimately directed is approximately 60 feet above the drain tank. Therefore, as the liquid rises and the static head becomes less, the latent heat boils off and two-phase slug flow exists. Control of a mixture is not possible with present design, and heater shell levels cannot be maintained constant. Extraction steam being intimately in contact with the shell side of the heater can be affected.

   Nozzles have been installed in the drain lines and cooler water injected to provide sub-cooling. On test, two-phase flow appears to have been eliminated. The heater level vascillations have become sinusoidal and therefore, with control modifications, be damped out. Lead-Lag modules will be added to the control system early in 1971. Design studies are being carried forward relative to piping modifications between moisture separators and drain tanks to insure "self-venting".

2. Load swinging starts when the turbine admission valve cam shaft reaches a position indicating 83% valve opening. At this position electrical output cycles about 20 M.W. with a 3 second period. Steam flow varies in similar fashion causing reactor water level to vary by 6 inches.

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2. However, during the upset, the turbine inlet pressure is controlled to 1 psi. These control valves do not have a perfect linear characteristic through their range and there is a "knee" in the curve at about this valve position. Cams contours have been changed but may still require adjustment. Checks are being made during load changes relating control relay, cam shaft, and valve movements to steam flow. At their completion, an evaluation will be made by the manufacturer.

3. In order to maintain the most stable reactor operation, the pressure has been controlled to within 0.5 psi at steady state operation. Even with the oscillations previously described, it varies only 1.7 psi. This is excellent regulation, but to achieve it a high degree of sensitivity must be built-in to the control. Close regulation can produce "hunting", particularly if a mismatch of sensitivity between the system being controlled and the control occurs.

Some problems have been encountered with the initial pressure regulators, particularly during the start-up test period. Since that time, their performance has been quite good. Please refer to a report from T. J. Dente to P. A. Burt, "Performance of Initial Pressure Regulators", enclosed herein.

Motivation for the power oscillations could originate from change in sensitivity of control valve response at 83% opening, as the swings start at this point when operating with the second stage of reheat out of service. However, with the second stage of reheat in service, the oscillations are produced irrespective of valve position.

Therefore, either or a combination could start the cycling. Testing has indicated the corrective measures necessary to neutralize the liquid removal problem. Testing is continuing to define if and to what extent adjustment of control valve characteristics is necessary. The possibility of reducing the initial pressure regulator sensitivity is being looked into.

An early resolution of the problem is expected.

Very truly yours,

P. Allister Burt

P. Allister Burt
Superintendent - Nine Mile Point

Enclosure

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INTERNAL CORRESPONDENCE
FORM 112-2 R 1-51

NIAGARA MOHAWK

DISTRICT Nine Mile Point

FROM T. J. Dente

DATE December 3, 1970 FILE CODE

TO Mr. P. A. Burt

SUBJECT Performance of Initial Pressure Regulators

The problem with the Mechanical Pressure Regulator (MPR) and the Electrical Pressure Regulator (EPR) can be placed into two categories: 1. Those occurring during start-up testing program and 2. Those occurring since start-up.

During the start-up testing program various problems were encountered with both the MPR and the EPR. Primarily, most of these corrections were ones that would be expected in the usage of a new piece of equipment. Modifications were made to the MPR and EPR as follows:

MPR - A needle valve was added to the sensing line to adjust sensitivity and improve the stability of the system. A bleed line was added to sensing line. The one micron filter was changed to a ten micron filter.

EPR - Capacitor 104C was changed from 1NF to 5NF improving the stability.

The pilot valve, bushing and dash pot on the MPR were damaged by dirt particles and had to be replaced.

Following the start-up program, the plant was shutdown from March 4, 1970 until July 12, 1970. From this date to the present, modifications were made to the MPR and EPR as follows:

MPR - The piping to the sensor line bellows was lengthened and changed to stainless steel from carbon steel. This eliminated the problem of corrosion products blocking the filters. Lengthening the line prevents condensate surges and provides control dumping.

EPR - Capacitor 104C was increased to 6NF from 5NF improving stability. Zener diodes were changed to cut the response voltage from 9 volts to 5 volts to stop saturation of the amplifier and stabilize the EPR-MPR take-over.

During this period of time, the EPR held pressure within 1/2 psi. After initial start-up and with experience, we have been able to match sensitivities between the EPR and MPR so that a smooth transfer can now be made from one to the other.

Date	Power Level	Problem	Correction
10/5/69	Hot Standby	With the MPR in operation and by-pass valve open switched to EPR bypass valve closed causing high pressure scram	
10/18/69	7%	MPR in control with 6 psi swing	Closed down on sensing line slightly - MPR stable
11/10/69	15%	MPR in control with ± 2 psi oscillations all bypass valves opened depressurizing reactor causing scram	Installed bleed off line on MPR. Found rotating bushing on MPR stuck with particles
11/13/69	Hot Standby	While lowering the MPR, 4 bypass valves opened causing low Rx water level scram	Added needle valve to MPR sensing line and replaced plugged dash pot, pilot valve and bushing
12/7/69	Hot Standby	± 2 psi oscillations 1 second period with EPR in control	Vented sensing line
12/18/69	50%	During start-up tests demonstrations, the takeover of the EPR from the MPR a drop of 7 psi occurred (979 psig to 972 psig)	Filters for M006 valve EPR plugged. Replaced and EPR stable
2/2/70	98%	During start-up tests on Pressure Regulators switched from EPR to MPR and after 10 sec. started a 6 psi peak to peak oscillation	Found that adjustment needed on sensing line needle valve. Made adjustment and MPR stable
2/8/70	98%	MPR in control and started 8 psi peak to peak oscillations	Adjusted MPR needle valve and MPR stable
7/8/70	5%	MPR causing slight cycling in bypass valves. GE people adjusting EPR and MPR for better stability	Adjusted needle on 7/10/70 changed sensing valve line from carbon steel to stainless steel on MPR and change capacitor 104C to 6 NF on EPR

Date	Power Level	Problem	Correction
7/20/70	20%	Changed from EPR to MPR and 200 psi peak to peak in pressure occurred - high flux scram level dropped 2 1/2' below normal FW flow dropped to $4X10^6$ then to $6X10^6$	Adjustment to MPR
10/19/70	5%	MPR in control and pressure oscillating 8 psi peak to peak	Adjusted sensor line needle valve