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Niagara Mohawk Power Corp. Syracuse, N.Y. 13202 T. J. Brosnan	6-16-72	6-16-72	X			

TO:	ORIG	CC	OTHER	SENT AEC PDR ✓ SENT LOCAL PDR
Mr. Donald J. Skovholt	1 signed	39		

CLASS:	INPUT	NO CYS REC'D	DOCKET NO:
(U) PROP INFO		40	50-220

DESCRIPTION: Ltr re our 5-18-72 ltr..furn info re design & administrative procedures at Nine Mile Station Unit I to preclude occurrence of a control rod drop accident & trans:

ENCLOSURES: Causes & Corrections for Rod Worth Minimizer Inoperability at the Nine Mile Pt. Nuclear Station Unit I

ACKNOWLEDGED
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PLANT NAMES: Nine Mile Nuclear Station Unit I

FOR ACTION/INFORMATION DL 6-19-72

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NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

300 ERIE BOULEVARD, WEST
SYRACUSE, N. Y. 13202

June 16, 1972

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

Your letter of May 18, 1972 requested information relating to the design and administrative procedures employed at the Nine Mile Point Nuclear Station Unit No. 1 to preclude occurrence of a control rod drop accident. Station procedures require that pre-planned control rod withdrawal sequences be followed during each startup to minimize the reactivity worth of individual control rods. In addition, conformance with these sequences can be verified in two ways: by use of the Rod Worth Minimizer (RWM) system or procedurally by a second licensed operator or qualified station employee. Your May 18, 1972 letter requested replies to four specific questions relating to this Rod Worth Minimizer:

History of RWM Operability

In most instances, i.e., more than 95% of the time, verification of conformance to the prescribed control rod withdrawal sequence has been provided procedurally due to inoperability of certain components of the RWM monitoring system as described below. In only two instances out of a total of 55 startups has the RWM system been fully operational.

Specific Causes of System Inoperability

System inoperability has been caused by combination of hardware and software problems as detailed in the attached tabulation. Inoperability attributable to software appears to be, at least in part, the result of complexity and inflexibility of the initial software program. The principal hardware problems have been those associated with external circuitry. For example, over 6,400 reed

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switches which provide intelligence to the RWM computer of rod position had to have been operable for the RWM system to perform its intended function. Similarly, 2,200 relays had to actuate properly. It has not been possible to maintain all the reed switches and relays in an operable condition over an extended period.

Current Operability of the RWM

Corrections which have been made to both the hardware and software portions of the RWM system to improve reliability are described in the attachment. Future operation will determine to what degree this effort has been successful. In particular, the ability to substitute rod position for a failed position switch should enhance the overall reliability of the RWM system. However, until improved reliability can be demonstrated by actual experience, flexibility in rod sequence verification should be maintained.

Plans and Schedule to Correct Any Deficiencies

As discussed above, substantial improvements to the RWM system have already been incorporated. Both Niagara Mohawk and General Electric will continue to closely monitor system performance and implement further modifications in design and maintenance wherever practical.

Very truly yours,

T. J. Brosnan
Vice President-Chief Engineer

CAUSES AND CORRECTIONS FOR ROD WORTH MINIMIZER INOPERABILITY AT THE NINE MILE POINT NUCLEAR STATION

Provided w/ltr dated 6-16-72

CAUSES	CORRECTIONS
RWM COMPUTER	
1. Mechanical and electrical failures in the input and output typer which caused a computer outage.	1. Installed necessary software to require operation of the typer only when needed by the computer for input or output printing. Previously, the typer was required to be continuously in service.
2. Stray current influence caused by improper grounding.	2. Ground circuitry reconnected to eliminate stray current flowing in a loop between the RWM and the process computer.
3. Failure of the cooling fan causing overheating.	3. Vane flow switches and temperature alarms were connected to the process computer to warn of RWM cooling system failure.
4. Internal wiring and circuit board component failures.	4. Defective wiring and components were replaced.
EXTERNAL RWM CIRCUITRY	
1. Numerous failures of electrical circuitry within the rod position indicator probe inside the reactor. These consisted of open circuits, grounds and shorts.	1. 129 position probes were replaced with new model probes. Like the original probes, any failures in these new probes will be uncorrectable while the reactor is in service.
2. Failures of the digital relays in the position indicator circuitry.	2. In part, these failures are produced by high voltage on the relays which is produced when grounds occur in the position probe circuitry. A voltage supply reduction provides a partial remedy. A better fix is under investigation by General Electric.

CAUSES	CORRECTIONS
EXTERNAL RWM CIRCUITRY (CONT'D)	
3. Stepping switch failure in the rod position indicator scan circuitry.	3. Replaced defective stepping switches and intensified maintenance program to improve reliability of these switches.
SOFTWARE	
1. Failure to properly transfer from one rod group to the next.	1. Additional instructions were prepared to better accommodate group changes up and down.
2. Stalling due to failure to execute an instruction within the design time limit.	2. The program was rewritten to reduce the number of steps required to execute a given instruction.
3. Interface difficulties between the output buffers of the process computer and the RWM computer.	3. It was arranged that the RWM will do the position scanning for itself and the process computer when the reactor is at lower power. This will eliminate some of the interference problems between the computer. Solution of the remaining interface difficulties is under development.
4. Misleading error printouts which resulted in improper operator corrective action.	4. Improved and simplified programming should reduce or eliminate these conflicts.
5. The inability of the program to accommodate loading new sequences except with all rods fully inserted even with the reactor in shutdown or refuel modes.	5. Program changes permit insertion of a substitute rod position when a position indicator has failed in rod notch just entered according to the prescribed patterns. The substitution is only made when the operator is assured on the basis of procedure or redundant instrumentation that the rod is in the position entered.