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ACCESSION NBR:8010280585 DOC.DATE: 80/10/22 NOTARIZED: NO DOCKET #
FACIL:50-220 Nine Mile Point Nuclear Station, Unit 1, Niagara Powe 05000220
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IPPOLITO,T.A. Operating Reactors Branch 2

SUBJECT: Forwards addl info required for review of 790920 application for amend to OL allowing power operation w/up to two inoperable recirculation loops.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

October 22, 1980

Mr. Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Dear Mr. Ippolito:

Our application for amendment to operating license dated September 20, 1979 provided technical specification changes to allow power operation with up to two inoperable recirculation loops. Recent discussions with your staff indicate additional information is required for your review of our application. The attached information addresses your request.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

D. P. Dise
Vice President Engineering

SWW:ja
Attachment

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NRC REQUEST FOR INFORMATION

PARTIAL LOOP OPERATION

Question 1

Provide documentation to justify the LOCA operating limits under partial loop operation.

Response

The loss-of-coolant accident results for non-jet pump plants, for one or more recirculation loops idle but unisolated, shows no change from the 5 loop operating results. Since there is no reduction in the coolant inventory available during blowdown (i.e. unisolated loops), peak clad temperatures are the same as during five loop operation.

The loss-of-coolant accident analysis for non-jet pump plants, for one or more recirculation loops isolated, is performed by reducing the coolant inventory in the vessel by the amount of coolant contained in the isolated loops. This is done in the blowdown calculation (SAFE code). The effect of the reduced coolant inventory causes uncovery a few seconds earlier. The resulting peak cladding temperature increase for one isolated loop was conservatively compensated for by a 2 percent MAPLHGR reduction in the Reference 1 calculations. The case for two isolated loops has been analyzed and results in twice the effect. This is expected because the overall contribution of the isolated loops' inventory from the total vessel inventory would not significantly change the slow transient characteristics of the limiting Nine Mile Point-1 break (0.07 $ft.^2$). Therefore, a 4 percent reduction in MAPLHGR is conservative for two isolated loop operation for Nine Mile Point Unit 1. Calculations in support of Reference 1 also show that the size and location of the limiting break is not changed for a small reduction in inventory.

REFERENCE: (1) "General Electric Company Analytical Model for Loss-of-Coolant Analysis in Accordance with 10CFR50 Appendix K, Amendment No. 2 - One Recirculation Loop Out-of-Service" NEDO-20566-2, Rev. 1, July 1978

Question 2

Provide documentation to justify operating four recirculation loops at 100% rated flow conditions.

Response

Each recirculation pump is rated to operate at a flow of 44,500 gpm, 820 rpm. This would allow the reactor to operate at a total recirculation flow of 67.5 million pounds per hour with 4 pumps.

Nine Mile Point Unit 1 has operated near rated flow conditions with four pumps since March 1980 with no adverse effects on plant operation.

While operating in this mode, the motor nameplate ratings of the recirculation pumps have not been exceeded. The scoop tube setting was increased from 50 to approximately 55 cycles per second to achieve the above flow and rpm conditions.

Question 3

What is the maximum obtainable power level under three loop operation?

Response

The maximum obtainable power under three loop operation is calculated based on the allowable power/flow curve contained in figure 3.1.7 of the Nine Mile Point Unit 1 technical specifications. The maximum power level would be obtained under maximum three loop flow conditions. The maximum three loop flow conditions would correspond to 100% rated pump flow for three pumps (i.e., three pumps x 16.88 MLB/hr = 50.6 MLB/hr) with no backflow through the inoperable loops. Utilizing the allowable power/flow curve, the maximum power level under three loop operation would be approximately 91.2% of rated.

Plant operating procedures require calculated total core flow be corrected to account for backflow through loops. This would reduce the total core flow and result in a corresponding reduction in allowable power as specified by the power/flow curve. The projected effects of backflow on partial loop operation power levels are summarized on Table 1.

Since there currently exists a method to limit core thermal power at less than rated flow conditions (i.e., Technical Specification Figure 3.1.7, power/flow curve), additional power level limits for three loop operation are not required.

Table 1

Nine Mile Point Unit 1

Partial Loop Operation Projected Power Level

No. of Loops Operating	Status of Inoperable Loop(s)	Oper. Loops Flow MLB/HR	Estimated(5) Backflow MLB/HR	Total Core Flow-MLB/HR	Allowable Power-%
4	1 loop isolated (1)	67.5	0	67.5	100.0
4	1 loop unisolated (2)	67.5	0	67.5	100.0
4	1 loop unisolated (3)	67.5	0.2	67.3	100.0
3	2 loops isolated (1)	50.6	0	50.6	91.2
3	2 loops unisolated (2)	50.6	0	50.6	91.2
3	1 loop unisolated (2) 1 loop unisolated (3)	50.6	0.2	50.4	91.0
3	2 loops unisolated (3)	50.6	0.4	50.2	90.9

(1) Suction, discharge, and bypass valves of the isolated loop is closed. MAPLHGR reduction is required.

(2) Suction or bypass valve is open; discharge and bypass or suction valves of the unisolated loop are closed. MAPLHGR reduction is not required.

(3) Suction and bypass valves are open; discharge valve of the unisolated loop is closed. MAPLHGR reduction is not required.

(4) Per the current power/flow line.

(5) This is a conservative estimate based on data. Actual total core flow will be monitored.

Question 4

Provide justification that inadvertent startup of an idle loop is more restrictive with four pumps than with three.

Response

Safety analyses are not affected by idle unisolated loop operation, since cold water injection transients are not possible in unisolated loops.

The inadvertent startup of an idle isolated loop results in a cold water injection transient. The transient response is governed by the initial power level and flow. The positive reactivity insertion due to the startup of the idle isolated loop is a function of the mass and temperature of the water injected relative to the core flow and is independent of the number of recirculation loops in operation. For equivalent core power and flow conditions, the startup of an idle isolated loop under either 3 loop or 4 loop operation would result in the same transient response. The power/flow curve defines the limiting power-flow conditions and is independent of the number of recirculation loops in operation. Therefore, the results of the previous idle loop analysis is bounding.

Question 5

Describe how the rod block monitor flow biased equations are adjusted to account for backflow.

Response

It is anticipated that during normal three loop and four loop operation, valve arrangements would be such that backflow does not occur through the idle loops. However, for those instances in which backflow is present, administrative procedures will specify that the APRM setpoint power level be adjusted upward to account for the small amount of backflow.

Due to the small amount of backflow, it is estimated that this adjustment would require less than an approximate 0.3% increase in the APRM power level. Since this adjustment is within the error band exhibited by the APRM system, it is expected to have little effect on plant operations.

Question 6

Previous documentation provided by General Electric for N-1 loop operation on jet pump plants indicates that operation in this mode results in additional TIP uncertainties and additional delta CPR adders. Provide justification that indicates why this analysis is not applicable to non-jet pump plants.

Response

Tests performed at Nine Mile Point Unit 1 (Reference 2) show low TIP noise uncertainty during four loop operation (see Table 2).

Analyses performed by General Electric (Reference 3) show greater TIP noise uncertainties for one loop in operation in jet-pump plants. The effect of the uncertainties is a 0.01 incremental increase in the required MCPR fuel cladding integrity safety limit for jet pump plants with one loop inoperable.

Based on the TIP noise uncertainty observed during four loop operation, it is expected the TIP noise uncertainties for 3 loop operation will also be low. Therefore, the analyses performed by General Electric (Reference 3) bounds three loop operation at Nine Mile Point Unit 1. To account for the effect of uncertainties, Niagara Mohawk will incorporate a conservative 0.01 incremental increase in the required MCPR fuel cladding integrity safety limit during 3 loop operation.

Table 2

Nine Mile Point Unit 1

Observed TIP Noise Uncertainty

Cycle	Operable Recirculation Loops	TIP Noise Uncertainty %
6	4	2.79

Reference: (2) Letter from D. P. Dise (NM) to T. A. Ippolito (NRC) dated August 27, 1979, Nine Mile Point Unit 1 startup Physics Test Results - Cycle 6.

(3) Cooper Nuclear Station Single Loop Operation NEDO-24258, May, 1980.

Question 7

How is flow physically measured in the plant (i.e., delta P transmitters, location, etc.).

Response

The recirculation flow at Nine Mile Point Unit 1 is measured by the use of redundant differential transmitters which monitor the flow across a venturi in the discharge portion of each recirculation loop.