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SUBJECT: Forwards responses to questions & clarification requests from 860321 telcon. Five SQRT/Pump & Valve Operability Review Team audit items discussed. Item re MSIV & valve testing discussed during conference.

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NIAGARA MOHAWK

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

May 5, 1986
(NMP2L 0699)

Ms. Elinor G. Adensam, Director
BWR Project Directorate No. 3
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Washington, DC 20555

Dear Ms. Adensam:

Re: Nine Mile Point Unit 2
Docket No. 50-410

This letter provides the responses to the questions and clarification requests resulting from the telephone conference between the Nuclear Regulatory Commission and Niagara Mohawk on March 21, 1986. The subject of the conference was Seismic Qualification Review Team/Pump and Valve Operability Review Team (SQRT/PVORT) audit items. In the conference, Nuclear Regulatory Commission personnel requested information on six items. The second item, which concerned the main steam isolation valves and their testing, was addressed during the conference. The remaining five items are addressed on the following pages.

Very truly yours,

CVMangan

C. V. Mangan
Senior Vice President

KTS:ja
1497G

xc: R. A. Gramm, NRC Resident Inspector
Project File (2)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)

Niagara Mohawk Power Corporation) Docket No. 50-410

(Nine Mile Point Unit 2))

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Senior Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

C V Mangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 5th day of May, 1986.

Christine Austin
Notary Public in and for
Onondaga County, New York

My Commission expires:
CHRISTINE AUSTIN
Notary Public in the State of New York
Qualified in Onondaga Co. No. 4787687
My Commission Expires March 30, 1987

Responses to NRC Questions From 3/27/86

Telephone Conference on SQRT/PVORT Audit Items

Question 1

Where is your response for MOV30A?

Response

MOV30A was discussed in our response dated September 30, 1985. It was transmitted to you as item P-A-14 which was the Niagara Mohawk numbering nomenclature.

Question 3

Summarize the stress analysis for service water valve MOV1A, including the valve parts, and interfacing hardware between the valve operator and the valve and the basis as to why the analysis is still valid with the new parts that have been placed into the valve.

Response

The original valve stems for these six valves, 2SWP*MOV1A thru 1F, which were made of 316 grade stainless steel, fail at approximately 276 ft. lbs. of torque, whereas the trip load (Torque Switch Setting) of the operator was in excess of 400 ft. lbs. This was in violation of the specification P304A. (Refer to attached table)

Contromatics corrected this problem by replacing the valve stems with new ones made from stainless steel 17-4 PH, which fail at 1500 ft. lbs. of torque. In addition the Limitorque operators were modified by installing new gears, which changed the gear ratio from 52:1 to 35.5:1. These changes reduced the operators stall torque to below the allowable stress for the new stems. (Refer to attached table)

The above modifications were not due to any changed criteria, but rather were to comply with the specification requirements. Further, the seismic conditions were not changed due to these modifications. These valves/operators were tested (per report no. 16985-82-N) for higher stall torque values. Accordingly, the modified valves/operators are still enveloped by the original qualification.

The only interfacing parts due to the above modifications are the ball and stem.

The ball and the stem stresses have been analyzed by Contromatics. (Refer to SFN-MICS-5.340-5001A)

° Ball side of the interface:

The force developed at 1500 ft. lbs. torque is 24,032 lbs. which is far less than the allowable valve of 58,290 lbs.

° Circular Section of the Stem

At maximum torque of 1500 ft. lbs., the maximum shear intensity developed is 47,163 psi, which is less than the allowable value of the circular section of the stem, 68,930 psi.

° Rectangular section of the stem:

The maximum shear developed (when the torque is 1,500 ft. lbs.) is 71,275 psi, which is less than its allowable value of 73,719 psi.

Further, Contromatics' letter of February 12, 1986 confirms that no other components are affected by the above modifications.

Question 4

For valves 2CCP*AOV37B and 2SWP*AOV22B, and the main steam isolation valves (2MSS*HYV6A,B), the NRC would like an outline of the qualification program and any deficiencies in the qualification of these valves.

Response:

A summary of the qualification programs for the above valves is provided below:

Valves 2CCP*AOV37B and 2SWP*AOV22B

The operability and structural integrity of the valve asssembly is assured through an evaluation of the parameters which could affect its function. These include temperature, pressure, flow, piping end loads, and seismic loads in addition to normal and accident environmental conditions.

The structural adequacy of the valve was assured through a static analysis of the valve assembly and a static deflection test of the operator limit switch bracket plate.

The functional adequacy of the air operator was demonstrated through type testing of a similar air cylinder and Class 1E operator components. These tests consisted of environmental and seismic tests which were conducted on the air cylinder, limit switches, and solenoid valve. The operator was demonstrated to function in a random, multifrequency environment, while the limit switch and solenoid valve were subjected to sine dwells and sine sweeps/beats, respectively.

The overall assembly operability was demonstrated through static deflection testing. This test demonstrated that there was no binding of the stem or of any other internal components.

The air operator and other class 1E age-sensitive components were evaluated for the normal and accident environmental parameters.

This program was supplemented by a seat leakage test on the valve disc and a hydrostatic shell test on the valve body, in accordance with ASME III requirements.

All the above analyses and tests have been completed with satisfactory results, and no deficiencies exist in the qualification of these valves.

To ensure the continued functionality of these valves throughout the plant life, they will be periodically tested under the ASME XI IWV program.

Main Steam Isolation Valves - 2MSS*HYV6A,B

(a) Qualification Program:

The operability and structural integrity of the valve assembly is demonstrated through a combination of analysis and tests. All the parameters affecting its function are evaluated. These include the flow, the thermal and pressure transients, the seismic and hydrodynamic loads, and the normal and accident environmental parameters. The effects of each of these are discussed below.

The design pressure and temperature, including the transients, are considered in the ASME Class 1 design analysis of the valve. This analysis also considers the seismic/hydrodynamic inertia loads in each direction.

The functional adequacy of the actuator is assured through a finite element stress analysis and dynamic testing. The original design of the actuator was modified by stiffening it, and a stress analysis was performed. The actuator is also dynamically tested. These tests consisted of a large number of random, multifrequency, biaxial tests to simulate seismic and hydrodynamic loads and load combinations and the associated durations. The resisting torque of the valve during the dynamic test of the actuator is simulated through a fixture consisting of a clutch.

The actuator is also qualified for the normal and accident environmental parameters.

The qualification program is further supplemented by a seat leakage test, hydrostatic shell test and a stem leakage test.

All the above analyses and tests have been completed with satisfactory results.

To ensure the continued functionality of these valves throughout the plant life, they will be periodically tested under the ASME XI IWV program and as required under 10 CFR 50, Appendix J for containment isolation valves as defined in the NMP2 Technical Specifications.

(b) Qualification Results & Resolution of Anomalies:

The design adequacy of the MSIV's has been established through an ASME III Class 1 design analysis which considered thermal and pressure transients and an inertia loading of 8.0 g's from seismic/hydrodynamic events.

The RRS for the various loads and loading conditions has been developed from the dynamic analysis of the as-built piping system. The dynamic testing of the actuator was successfully completed for the SRV, the upset and the faulted condition loadings, with the TRS enveloping the RRS in the applicable frequency range. However, in the last phase of this testing, i.e., in the dynamic tests simulating the LOCA-related hydrodynamic vibrations, the roller bearing on the blocking lever assembly was found to have cracked and the latching lever bracket was damaged. This caused the specimen to not trip. This anomaly has been resolved as follows:

(a) The roller bearing has been replaced by a new bearing having a higher load bearing capacity,

(b) The blocking lever pivot support was redesigned by inserting dowel pins, and

(c) Conducting a life cycle test of the actuator.

Based on the above, the latching mechanism of the actuator is qualified for five years. It is noted that the loads on the roller bearing due to seismic/hydrodynamic vibratory effects are not more than 15% of the total load, and the dynamic tests completed prior to the occurrence of this anomaly have been demonstrated to adequately account for the fatigue effects of the seismic/hydrodynamic loads for a 40 year life of the actuator. Thus, no retesting of the actuator was necessary.

Question 5:

Regarding the relief valve RV36A and generic issue 4, the NRC asked a question regarding four NSSS pumps and valves and BOP for pumps and valves. This question is subdivided into six parts, as indicated below.

Note: Parts of this question have been answered in the previous submittal (NMP2L 0646) which is provided for your convenience in Attachment 1..

Part 1:

How we considered temperature, vibration, and head for the pumps and how we did the analysis and verified fluid/dynamic flow?

Response Pumps

Design parameters for pumps are specified in the procurement/design specifications. Ambient temperature, as well as fluid temperature ranges, are included in the design documents. Rapid thermal transients are not

anticipated for pumps, and as such, are not specified. External dynamic (vibratory) loadings are specified and considered in the design. Vibration due to pump operation is measured during startup testing and monitored by periodic testing in accordance with the NMP2 ASME XI IWP program to detect wear induced vibration. Suction and discharge head ranges are specified and included in the design. Minimum NPSH requirements are verified by calculation and measured during startup testing. In general, pumps are protected from hydraulic transients by discharge check valves, except for dynamic loadings transferred through the piping. These loads have been evaluated and included in the design calculations when applicable.

<u>Response</u> <u>Valves</u>

The temperature and pressure transients for the valves listed in the reference letter (NMP2L 0646) are considered in the design analysis, when their effect is significant. Three groups of the listed valves (letter NMP2L 0646), in particular, are analyzed for these effects as follows:

(a) The reactor vessel is protected from the dynamic effects of a postulated feedwater pipe rupture outside containment by the feedwater check valves. The analysis examined the ability of these valves to withstand seat impact by the disc following rapid pressure reduction accompanying the rupture. Stresses and loads from the disc impact were computed using the nonlinear transient option of the ANSYS program. Seismic, hydrodynamic and dead loads were of insignificant magnitude compared to impact loads. Critical elements examined were the rock shaft, tail link, seat and disc; stresses due to impact were less than ASME III, Class 1, Appendix F faulted condition allowables.

(b) Analysis of the vacuum relief valves for disc impact under critical transient conditions has been described in the referenced submittal.

(c) For the feedwater check valves and air operated testable swing check valves, calculations were performed to evaluate combined seismic and hydrodynamic loads, together with the pressure and thermal transients for fatigue cycle limits and stress magnitude on critical components. Stresses were maintained within ASME III stress levels, and cumulative usage factors due to all the transient conditions were less than unity.

<u>Part 2</u>:

The NRC suggested that we reference any qualification testing so that we could show that it was a combination test and analysis

<u>Response</u>

In addition to analyses, qualification of the check and relief valves includes the following shop tests: 1) hydrostatic shell and seat tests, 2) pneumatic seat leakage test, 3) assembly performance tests (for testable or air assist check valves) to demonstrate that there is no binding or misalignment. Examples of the test procedures and results were provided to the NRC at the PVORT audit.

In addition to shop testing, there are several tests performed at the plant in accordance with the Preservice/Inservice Testing Program and startup testing program. These are summarized below:

Pumps: Reference values from peroperational and preservice testing shall be determined. The reference values are defined as one or more fixed sets of values of the parameters shown in Section XI Table IWP 3100-1, as measured or observed when the equipment in known to be operating acceptably. These parameters include speed, inlet pressure, differential pressure, flow, vibration amplitude, and bearing temperature. The specific requirements for each safety related pump are defined in Appendix A of the "Inservice Testing Plan for Pumps and Valves for Nine Mile Point Unit 2".

When a reference value or set of values may have been affected by repair, replacement or routine servicing of a pump a new reference value or set of values shall be determined. Deviations between the previous and new set of reference values shall be identified and documented. Verification that the new reference values represent acceptable pump operation shall be retained in the test records for all pumps.

Valves: The preservice tests required by IWV 3100 shall be performed on all of the valves listed in Appendix B to "Inservice Testing Plan for Pumps and Valves" for Nine Mile Point Unit 2 after installation and prior to service. Initial reference values shall be determined from preoperational and preservice testing. The testing to determine reference values shall be performed under conditions as near as possible to those expected during subsequent inservice inspection. All subsequent test results will be compared to the initial reference values. When a valve or its control system has been replaced, repaired, or undergone maintenance that could affect its performance, it shall be tested to demonstrate that performance parameters that could be affected by the replacement, repair or maintenance are within acceptable limits.

The reference values are defined in Appendix B to "Inservice Testing Plan for Pumps and Valves" for Nine Mile Point Unit 2. These parameters include valve stroking, type C leak testing, setpoint determination, exercising, position indication determination, and ASME Section XI leak testing.

Part 3:

The NRC was also concerned about static deflection testing or full flow testing in fluids.

Response

For valves with extended structures, operability of the valve assembly under seismic/dynamic loads is generally by static deflection testing. Of the valves listed (see response to generic item 4, NMP2L 0646), only the feedwater check and testable swing check valves have extended structures.

For these valves, the air operators are used for test purposes only and are not required for the safety related function of the valves. Therefore, no static deflection testing is necessary.

Part 4:

Additionally, the NRC was concerned about accidents, i.e., how we analyzed the accidents analysis, considerations such as line break outside containment for RCIC isolation valves?

Response

Line break outside of containment for RCIC isolation valves was not specifically analyzed. However, these valves were shop tested to open against maximum differential pressure of 1158 psig, which assumes a maximum inlet pressure and no downstream back pressure. The differential pressure exerts the maximum force on the valve disc that will be seen in service (pressure x disc area + force required to unseat valve). In the closing cycle, this force (valve seat area x 1158 psig) is approached as the valve closes and for practical purposes, the valve will be closed when this force is reached. The valve operation is sized to provide additional torque (force) to close the valve tight.

Part 5:

Further, the NRC asked, regarding check valves, whether we had assessed the minimum flow effects on check valves to verify the disks would remain open rather than chattering?

Response

All safety related swing check valves were reviewed for chattering due to low flow conditions in accordance with IE Bulletin 79-04.

Part 6:

Specific to RV36A, is it the same family or the same model number of the valves that we performed a similarity analysis to the LaSalle valves?

Response

The Lasalle vacuum breaker valve, which was tested, is similar (same size, similar design, and same vendor) to the Nine Mile drywell floor vacuum breaker. The similarity characteristics of valve 2RHS*RVV36A to these drywell floor vacuum breakers are described in the original response in NMP2L 0646. This valve is not the same model as the drywell floor vacuum breaker; however, it is the same family and manufactured by the same vendor.

Question 6:

Part 1:

From NMP-2 SSER2 Item 3.10.2.3(1), confirm that all preoperational tests are completed before fuel load.

Response

All preoperational tests will be complete prior to fuel load, except for those described in our letter dated April 7, 1986.

Part 2

From NMP-2 SSER2 Item 3.10.2.3(2), confirm that all pumps and valves important to safety are qualified.

Response

All safety related pumps and valves will be qualified before fuel load.

TABLE

Item	Valve Mark #	Torque at Which Stem Starts to Fail		Trip Load Torque Switch Setting		Stall Torque	
		Original	Modified[2]	Original	Modified[1]	Original	Modified[1]
1	2SWP*MOV1A	276 ft. lbs.	1500 ft. lbs.	488 ft. lbs.	314 ft. lbs.	2200 ft lbs.	1417 ft. lbs.
2	2SWP*MOV1B	276 ft. lbs.	1500 ft. lbs.	688 ft. lbs.	443 ft. lbs.	2130 ft. lbs.	1372 ft. lbs.
3	2SWP*MOV1C	276 ft. lbs.	1500 ft. lbs.	647 ft. lbs.	417 ft. lbs.	2244 ft. lbs.	1446 ft. lbs.
4	2SWP*MOV1D	276 ft. lbs.	1500 ft. lbs.	524 ft. lbs.	338 ft. lbs.	2033 ft. lbs.	1310 ft. lbs.
5	2SWP*MOV1E	276 ft. lbs.	1500 ft. lbs.	875 ft. lbs.	564 ft. lbs.	2112 ft. lbs.	1361 ft. lbs.
6	2SWP*MOV1F	276 ft. lbs.	1500 ft. lbs.	616 ft. lbs.	397 ft. lbs.	2288 ft. lbs.	1474 ft. lbs.

1) Gear ratio change from 52:1 to 33.5:1 resulted in the Lower Torque valves.

2) Replacement of the stem 316 grad stainless steel to 17-4 PH stainless steel improved this value.