ENCLOSURE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO PROPOSED DEFERMENT OF TORUS MODIFICATIONS

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION UNIT NO. 1

DOCKET NO. 50-220

1.0 INTRODUCTION

The torus shell of the Nine Mile Point Unit No. 1 (NMP1) containment was designed and constructed of carbon steel with the inside surface of the shell uncoated. The original design of the torus included an allowance for shell corrosion. Niagara Mohawk Power Corporation (the licensee) has been monitoring the torus shell material thickness for thinning due to corrosion since 1975. The critical corrosion takes place on the inner surface of the torus shell below the suppression pool water level. The original analysis for the torus shell determined that the minimum required thickness of the shell was 0.40 inches. The as constructed torus shell was certified as having a minimum thickness of 0.46 inches, leaving a corrosion allowance of about 1/16 inch. However, the original analysis did not include consideration of hydrodynamic loads due to a LOCA or actuation of the safety/relief valves (SRVs); these loads were considered afterwards when the hydrodynamic function was realized. In January 1988, a plant unique load analysis was performed which included the LOCA and SRV hydrodynamic loads. These additional loads were added to the containment design bases and it was determined that the original containment shell thickness was sufficient to accommodate these loads

since the revised analysis required a torus shell minimum thickness of 0.447 inches at the critical location (bottom of torus) leaving an original corrosion allowance of at least 0.013 inches.

The licensee has taken ultrasonic thickness measurements of the torus shell material since 1975. In early 1988, licensee measurements indicated that several areas of the torus shell material appeared to be approaching the minimum required wall thickness of 0.447 inches. An independent inspection of the torus by NRC inspectors in March-April 1988 (Inspection Report No. 50-220/88-09) confirmed the licensee's measurement techniques and thickness values. By letter dated May 27, 1988, the licensee committed to perform (by June 30, 1989) mid-cycle thickness measurements to confirm that the torus shell still met the minimum required wall thickness. By letter dated January 12, 1989, the licensee revised this commitment and agreed to perform torus shell thickness measurements of the six bays identified as having the minimum wall thicknesses approximately every 6 months.

Ultrasonic thickness measurements of the torus shell have been performed by the licensee at 6-month intervals since 1989. These measurements have determined an average corrosion rate of 0.00083 inch per year. However, to account for uncertainties, one standard deviation was added to this corrosion rate resulting in a conservative prediction of 0.00126 inch per year. Continuation of this corrosion will result in reducing the torus wall material to less than the minimum required thickness of 0.447 inches. Alternative methods for coping with this continuing corrosion and resulting thinning of the torus shell material have been considered by the licensee. The alternative methods included the use of cathodic protection, installation of

protective coatings on the inside surface of the torus shell, and modifications to the torus.

By letter dated February 14, 1989, the licensee stated it planned to modify the torus during the next refueling outage to provide the required torus wall thickness margin for the life of the plant. The NRC staff subsequently concluded (Inspection Report No. 50-220/89-28) that the plant could be safely operated for the remainder of the current fuel cycle (cycle now scheduled to end in January 1993) provided the licensee continues to monitor the torus shell thickness at 6-month intervals.

In January 1992, (Inspection Report No. 50-220/92-01) NRC inspectors repeated the March-April 1988, confirmatory inspection of the torus shell. This inspection disclosed one point with a measured thickness of 0.445 inches. Although this one point was less than the minimum required wall thickness of 0.447 inches, the torus is still acceptable for continued use in accordance with the provisions of Section NE-3213.10 of the ASME Code (1977 Edition, including the Summer 1977 Addenda).

In the process of planning the torus modifications, the licensee determined that there are conservatisms in the LOCA condensation oscillation (CO) loads which, if reduced, would result in a reduced minimum wall thickness requirement. The reduced minimum wall thickness requirement would provide additional corrosion allowance. Therefore, by letter dated May 14, 1991, the licensee submitted a request to take credit for a reduction in the CO loads. The licensee has determined that this proposed reduction in the CO loads would allow a deferral of the modifications committed to in the February 14, 1989, letter until approximately 2007. The licensee's conclusion regarding deferral of modifications was based on an analysis which shows: (1) a significant

reduction in the CO loads on the torus, and (2) corrosion rates of up to 0.00126 inch per year. Supplemental information, which was submitted in response to NRC staff requests for additional information, was provided in licensee letters dated August 29, 1991, September 27, 1991, October 17, 1991, December 13, 1991 (two submittals), and January 17, 1992.

The licensee's May 14, 1991, submittal includes a plant-specific analysis of the hydrodynamic loads on the NMP1 torus shell. This analysis was prepared by the licensee's consultant, Teledyne Engineering Services. The purpose of this analysis is to more precisely define the loads on the torus shell. With a more precisely defined CO load, which in effect reduces the CO load by removing some conservative assumptions in the original load definition report analysis, the licensee's analysis shows that the original containment still contains sufficient reserve to accommodate the hydrodynamic loads in conjunction with the corrosion that has occurred in the torus shell.

The NRC staff obtained assistance from the Brookhaven National Laboratory (BNL) in the review of the licensee's May 14, 1991, submittal which proposes to reduce one component of the suppression pool hydrodynamic loads, in this case the unstable CO loads. A copy of BNL's evaluation is included in Attachment 1. BNL had performed a review for the staff of a previous submittal by the licensee in September 1984 in which the licensee had requested a reduction of the CO loads with a different method of analysis to account for uncorrelated sources. By letter dated January 22, 1985, the staff approved that request which in effect reduced the torus wall stresses approximately 7.5%. The current submittal under evaluation is not intended by the NRC staff to supplement the previous reduction approved in January 1985, but is interpreted by the NRC staff to be a new method of analysis to be

applied to calculate the torus wall pressures from CO without using the previously-approved reduction contained in the September 1984 submittal.

2.0 EVALUATION

The hydrodynamic loads have undergone several reductions since the Boiling Water Reactors Owners Group (BWROG) sponsored a program to define the hydrodynamic loads. The licensee requested in their May 14, 1991, submittal that the staff review another modified methodology which would more closely reflect the NMP1 containment torus configuration.

The licensee's request is in part based on several overly conservative assumptions in the original BWROG methodology contained in the load definition report when applied to NMP1. First, the load definition report was based on results from a full scale test facility (FSTF) which was constructed with two torus bays of downcomers where each bay contained eight downcomers. However, the NMP1 torus configuration is different in that the NMP1 torus consists of 20 bays which alternatingly contain four downcomers and eight downcomers. The FSTF having been arranged to represent eight downcomers for each bay arrangement would therefore show higher loads in each alternate bay when compared to NMP1 which contains only four downcomers in every second bay. This difference between the FSTF and NMP1 configurations would introduce a conservatism which can be evaluated by accounting for the reduced wall pressures that would be seen in the four downcomer bay if the NMP1 arrangement were modelled at FSTF. The licensee developed an acoustic model to calculate the wall pressures in the torus bays which contains a four downcomer arrangement. This method is discussed in the attached BNL evaluation. The staff agrees with the conclusions reached by our contractor and, therefore, finds it acceptable.

Secondly, the FSTF modelled only two bays of a containment torus and was therefore a scaled model intended to represent a complete Mark I torus. This model, because of the two bay configuration, was constructed with a rigid end cap at each end of the modelled torus, the end caps however have the effect of introducing a higher contribution to the wall pressures which are artificially amplified when evaluated against a model which would account for an actual torus of 360 degrees and no end caps. The contribution to the wall pressures, as measured in the FSTF, from the rigid end caps of the FSTF was evaluated and this contribution from the end caps can be removed from the load definition report wall pressures as given in the load definition report through the acoustic analysis proposed by the licensee.

The attached BNL evaluation concludes first that the licensee's evaluation is more rigorous in the evaluation of hydrodynamic loads than the work performed in the September 1984 submittal. The method of reduction sought in this submittal by the licensee is a more direct method of refining the CO loads as described in the load definition report. As described in the BNL evaluation under "Concluding Remarks," BNL finds that the methodology used by the licensee to account for uncorrelated sources (steam bubble formation which is out-of-phase with adjacent downcomer steam bubbles) are modelled more correctly through the use of reduction factors which will account for the out-of-phase steam bubble formation, as applied to the wall pressure amplitudes rather than the previously-approved method which addressed structural response rather than the hydrodynamic phenomena directly. The combining of wall stresses through the use of a combination of absolute sum and square root of the sum of squares as proposed in the September 1984 submittal was a method which reduced the calculated wall stresses of the containment structure to

account for conservatively calculated wall pressures which did not account for uncorrelated sources. The NRC staff agrees with this evaluation since the purpose of both the present and 1984 submittal was to account for the fact that FSTF results indicate the correlation of downcomer sources appears to occur only between the 5-6 hertz range and therefore the reduction factors applied to the modes outside this frequency range are realistic. The use of correlated and uncorrelated reduction factors is a more direct way of accounting for correlated and uncorrelated sources rather than adjusting the stress combination method as used in the September 1984 submittal.

The BNL evaluation's second concluding remark states that stresses developed as a result of the reduced CO loads should be combined by absolute sum as in the load definition report and not by square root of the sum of squares as was used in the September 1984 submittal. The NRC staff concludes that since correlated and uncorrelated sources are now accounted for under the current methodology proposed by the licensee, the wall stresses should be combined as absolute sum as prescribed in the load definition report. As discussed above, the purpose of the square root of the sum of squares method was to account for uncorrelated sources at the downcomers. Since this phenomenon is now accounted for with reduction factors, wall stresses must be combined per the load definition report which is absolute sum. Although the licensee's analysis supports reducing the stress values up to 61% of the values in the load definition report, the NRC staff in a telephone conference with the licensee on December 3, 1991, expressed the position that in order to maintain margin for uncertainties, under no circumstances should the stress values be reduced to less than 70% of the values in the load definition report. (The overall reduction of loads from the load definition values had

been previously reviewed by BNL in response to the licensee's September 1984 submittal. That review found that reductions in loads from the original load definition report values to less than 70% of those values were technically acceptable. However, the BNL analysis of the September 1984 submittal contained no margins in the calculation of the torus CO loads and therefore the NRC staff did not permit reduction below 70% of the load definition report values.) Limiting the stress reduction to 70% of the load definition report values appears appropriate if the load definition report methodology is followed in all other respects; that being the absolute sum of wall stresses. The licensee agreed that they understood the NRC staff's position and found that approach agreeable as stated in licensee's letter dated December 13, 1991. The NRC staff concludes that the methodology of applying the load definition report values with correlated and uncorrelated reduction factors and stress combination of absolute sum technique is acceptable.

BNL notes in their evaluation that they (BNL) have not performed direct confirmation of the numerical analysis performed by the licensee. The staff finds this acceptable since the purpose of this safety evaluation is to approve the methodology used by the licensee to calculate specific design parameters. However, the NRC staff has had discussions with the licensee on the technique used to perform the analysis and the attached BNL evaluation contains specific details describing the licensee's method. The NRC staff finds that the specific calculations performed by the licensee are straightforward and well understood by the NRC staff and licensee and are not associated with a new technology or subject to application of engineering judgment. The NRC staff does not typically review all calculations performed

by a licensee, but the staff does conduct technical audits through the inspection program to assess compliance with regulations or licensing basis documents. Therefore, the NRC staff may chose to audit this area in the future, but does not consider such an audit necessary at this time.

The NRC staff and our contractor, BNL, finds that the proposed methodology for reduction of CO loads, as proposed in the licensee's submittal and subsequent transmittal of December 13, 1991, describes an acceptable method for calculating CO loads on the torus shell.

The reduced loads (due to CO load reduction) were then used by the licensee to analyze potential stresses in the torus shell. The stress analysis of the torus shell was accomplished using the same STARDYNE computer model used in the original torus analysis to calculate the effects of all loads on shell stresses. The analytical model represents a 1/40th section of the torus. With the reduced CO loads and assuming the original thickness of 0.46 inches, the membrane stress of the shell at the critical location is reduced from 16,025 psi to 15,452 psi. According to ASME Section III Code (1977) the allowable stress of the shell material used is 16,500 psi. With the reduced CO loads, this maximum allowable stress would not be reached until the torus shell thickness is reduced to less than 0.431 inches. The NRC staff has reviewed the analysis and found it to be acceptable. Based on the observed corrosion rate and an expectation that the thinnest panels of the torus wall will be reduced to an average thickness of 0.447 inches in 1994, the licensee has determined that the maximum allowable stress value would not be reached until approximately the year 2007.

Since the approximate time frame thus determined is based on a corrosion rate of up to 0.00126 inch per year, the NRC staff believes that it is

appropriate for the licensee to continue to monitor the corrosion rate of torus shell material to assure that any reduction in the shell thickness due to corrosion will not result in stresses larger than the code allowable in any future operation. Therefore, the licensee is requested to implement the following monitoring programs:

1. UT thickness measurements of all torus bays shall be performed before completion of the next refueling outage (scheduled to begin in January 1993) in the same manner as was done in August 1989. The same UT thickness measurements of all bays are required in order to confirm that the assumed maximum average corrosion rate of 0.00126 inch per year is conservative and to assure that the six bays previously identified as having the minimum wall thickness and being monitored every 6 months are the only bays requiring periodic monitoring.
2. Unless additional bays requiring periodic monitoring are identified, and more frequent monitoring is required as determined from the results of Item 1 above, the current program of UT thickness measurement at 6-month frequencies for the six torus bays shall be continued. At each of these bays, a standard corrosion sample coupon with the same steel material as that of the torus shell shall be installed at the waterline in the suppression pool with approximately one-half above and one-half below the waterline. The corrosion rate obtained from these coupons shall be compared (once per refueling outage) to that from the UT measurements of the shell and the most conservative corrosion rate shall be used to make future corrosion rate determinations.

3. Item 1 above shall be repeated at a frequency not less than that of containment inspections pursuant to 10 CFR Part 50, Appendix J, before performing the periodic Type A tests if a corrosion rate of greater than 0.00126 inch per year is determined. The monitoring results shall be reviewed to assure that the minimum wall thickness requirement (0.431 inches) will not be exceeded during planned subsequent operation.

4. If the corrosion rate does not exceed 0.00126 inch per year and therefore reinspections in accordance with Item 3 above are not required, a reinspection in accordance with Item 1 above shall be repeated after approximately 10 years.

The results of the above monitoring programs shall be submitted to the NRC within approximately 60 days after completion of each inspection.

3.0 CONCLUSION

On the basis of the NRC staff's evaluation of the information provided by the licensee, the NRC staff concurs with the licensee's conclusion that as a result of the reduction in the condensation oscillation loads, the Nine Mile Point Unit 1 torus currently meets the Code requirements and will continue to meet Code requirements provided the average minimum wall thickness of the torus shell is not reduced to less than 0.431 inches. In order to assure that this minimum wall thickness is maintained, the above described monitoring programs shall be implemented.

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Evaluation of NMC* Technical Basis for Reduction of NMP Torus CO Loads

by

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Revised February 1992

Summary

BNL's evaluation of the technical basis submitted by NMC to justify a reduction in the NMP Torus CO loads is documented via this letter report. The evaluation includes a review of the historical developments that preceded the current submittal. These are pertinent because they represent the point of departure for the proposed modifications. BNL's finding is that the methodology used to demonstrate that a reduction in these loads is appropriate is technically sound and justifies the requested modifications.

Background

The generic CO load definition and its genesis are described in the Mark I LDR[1]. It was synthesized from the pressures recorded during the worst case blowdown (Test Number M8) from the first FSTF test series[2]. This test simulated a large liquid break but was conducted at the relatively low pool temperature of 70 °F, a value less than the current Technical Specification (TS) for continuous operation (the LCO). These loads were approved by the NRC, subject to the results of additional confirmatory tests[3]. The pressures observed in these later tests[4] were higher for liquid blowdowns conducted at somewhat higher pool temperatures. Specifically, Test Number M12, conducted at an initial pool temperature of 95 °F, gave rise to pressures that were about 15% higher than peak M8 values. Note that this temperature level is roughly equal to the current TS on the LCO (90 to 95 °F) and is somewhat less than the modified value of 100 °F that the BWROG has requested the NRC to approve[5]. Notwithstanding the increased loads observed during Test M12, the original load specification was found acceptable[6] based on a favorable comparison between the measured and predicted stress levels for the FSTF. In some cases, the prediction exceeded measurements by as much as 150%.

The conservatism of the LDR load specification stems primarily from the requirement that all of the harmonic component responses be added by absolute sum. This is equivalent to assuming that the excitation created by oscillation of the steam-water interface at the end of each of the eight downcomers is synchronized over the entire frequency range that was observed (up to 50 Hz). The staff recognized that this approach is conservative and relaxed the AC based on several later studies submitted by GE and its consultants[7,8,9]. For NMP, in particular, a modified CO load was approved during review of their PUAR[10]. This modification accounted for the absence of complete correlation between vents by taking the absolute sum of only the four highest harmonic responses and adding the SRSS of the

*See List of Abbreviations for definition of acronyms.

remaining ones. Note that this procedure reduces critical stresses but does not explicitly change the forcing function itself which consists of the pressure loading on the submerged boundaries. The basis for approving this approach was that it still bounded the measured response when applied to the FSTF. When applied to NMP, the critical stresses in the shell remained below allowables.

The need to reduce the CO loads below the generic LDR values arose because of NMP's thin torus shell. With the passage of time, there has been a further reduction in the shell thickness due to corrosion. This reduction is a continuing process which NMC and its consultant estimate occurs at a rate of .00126 inches per year[11]. If the CO loads are not changed, critical stress levels are expected to exceed allowables during 1994. To delay the need to structurally reinforce the torus, NMC has proposed a reduction in the load specification. The technical justification for this reduction is described and evaluated in the ensuing sections.

Description of the Proposed Methodology

The methods proposed by NMC to demonstrate that a reduction in CO loads is justified are described in two documents prepared by a consulting firm[12,13]. Key elements of the presentation are as follows:

1. FSTF test data are used to demonstrate that significant correlation of the CO process at the exit of the eight downcomers occurs only in the 5-6 Hz frequency range and that, at other frequencies, the process and its contribution to the pressure signature is random.

2. It is noted that the FSTF test facility is not prototypical of an actual Mark I torus because of the end caps which act as planes of symmetry between adjacent bays. It is claimed that the consequence of this geometric feature is that the incoherent contributions to the observed pressures are amplified.

3. It is further noted that the FSTF facility is also not prototypical of the NMP torus since, in the latter, four downcomer bays alternate with eight downcomer bays[14]. In this case it is claimed that this geometric discrepancy implies that the FSTF pressures are excessive for both the four and eight downcomer NMP bays, and that this is true over the entire frequency range including the synchronous 5-6 Hz value.

4. An acoustic model applied to an idealized version of the NMP torus (horizontal cylinder half filled with water) is developed and utilized to quantify the effects enumerated above. The results from this analysis are presented as reduction factors[15] that are to be applied to the LDR pressure amplitudes[16]. These factors depend primarily on bay geometry and the nature of the CO process, ie., coherent or random. They also exhibit a slight dependence on frequency. The reduction factors* are about 60% for the four downcomer geometry and 80% for the eight downcomer bay configuration for uncorrelated CO. The corresponding factors for the correlated case are approximately 70% and 95%, respectively. These represent bay averaged values.

*The term "reduction factor" is used here and in Reference 12 to indicate a multiplier of the original value.

5. Correlated reduction factors are to be applied only to the 5-6 Hz pressure amplitude. For the remaining frequency spectrum, uncorrelated values are to be utilized. After the LDR pressures are reduced by these factors, the structural analysis is to "be undertaken as per the LDR."[17]

With respect to the original analysis[18], these procedures yield a 4% reduction of the controlling stress (membrane) for an eight downcomer bay and a 10% reduction for a four downcomer bay[11]. In terms of shell thickness, these correspond to reductions of 16 and 44 mils, respectively. The corresponding values given in a more recent submittal[19] are 18 and 37 mils. It is stated there, that these correspond to a 17% and 30% reduction in the LDR CO loads, respectively.

Evaluation of the Proposed Methodology

In BNL's judgement, the reduction in the CO loads that NMC has requested are reasonable, conservative, and technically defensible. The basis for this conclusion are as follows:

1. The FSTF data support the notion that the CO process is random over most of the frequency spectrum considered in the load methods.

2. Because of the geometric differences, particularly the 4-8-4 downcomer arrangement, the pressure loads during a CO blowdown will tend to be greater in the FSTF relative to the NMP torus for the same thermodynamic flow conditions.

3. The procedure used to quantify the effect of Items 1 and 2 represents a straightforward application of a conventional hydrodynamic method. The results are reasonable and probably conservative because of the high sound speed used in the numerics*. We also consider the assumption that a correlation exists between bays to be a significant conservatism.

4. The overall reduction of the loads from LDR values is significantly less than that approved earlier by the staff[20]. This reduction was found acceptable because it was able to accommodate all of the stresses observed during the FSTF tests.

Concluding Remarks

There are three points we want to emphasize here. The first is that the procedure we have evaluated represents a more rigorous, almost first principles way, to accomplish what was done before in an approximate way. As we already noted in our background discussion, the modification that was utilized by NMP earlier did not involve any change in the LDR pressures. Relief was obtained by not summing the stresses induced by each and every one of the fifty harmonic excitations by absolute sum as required by the LDR methodology. That this was an acceptable procedure could only be demonstrated by comparing predicted FSTF

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*Modeling of the torus as half filled with water is a minor nonconservatism (NWL in Mark I plants is well below the torus centerline), but is a reasonable simplification of an analysis which is already quite complex.

stresses with measured FSTF stresses. In distinct contrast, the present method provides relief by reducing the excitation (pressures) itself.

The second point is that the basis for Item 4 rests on our assumption that when the applicant refers to "LDR values" what is meant are the stresses that result by applying the LDR pressure amplitudes and then combining all of the individual peak stresses by absolute sum. The documents that we have in hand are somewhat ambiguous on this point and it would be prudent to obtain documented confirmation that our interpretation is correct.

Finally, we note that our review of the analysis does not include direct confirmation of any of the numerical results that were presented, e.g., the reduction factors. It is assumed that these derive from a correct application of the methodology.

References

1. General Electric Company, "Mark I Containment Program Load`Definition Report," General Electric Topical Report NEDO-21888, Revision 2, November 1981.

2. Fitzsimmons, G.W., et al., "Mark I Containment Program Full-Scale Test Program Final Report, Task Number 5.11," General Electric Proprietary Report NEDE-24539-P, April 1979.

3. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report, Mark I Long Term Program, Resolution of Generic Technical Activity A-7," NUREG-0661, July 1980.

4. General Electric Company, "Mark I Containment Program Letter Report: Supplemental Full-Scale Condensation Test Results and Load Confirmation," MI-LR-81-01-P, April 1981.

5. Mintz, S., "BWR Suppression Pool Temperature Technical Specification Limits," General Electric Report NEDO-31695, May 1989.

6. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report, Mark I Long Term Program, Resolution of Generic Technical Activity A-7," NUREG-0661, Supplement 1, August 1982.

7. "Mark I Containment Program Evaluation of Harmonic Phasing for Mark I Torus Shell Condensation Oscillation Loads," NEDE-24840, prepared by Structural Mechanics Associates for General Electric Company, October 1980.

8. Kennedy, R.P., "Response Factors Appropriate for Use with CO Harmonic Response Combination Design Rules," SMA 12101.04-R002D, prepared by Structural Mechanics Associates for General Electric Company, March 1982.

9. Kennedy, R.P., "A Statistical Basis for Load Factors Appropriate for Use with CO Harmonic Response Combination Design Rules," SMA 12101.04-R003D, prepared by Structural Mechanics Associates for General Electric Company, March 1982.

10. Bienkowski, G., Lehner, J.R. and Economos, C., "Technical Evaluation of the Nine Mile Point Unit 1 Nuclear Generating Station Plant Unique Analysis Report," BNL-04243, September 1984.

11. "Nine Mile Point Unit 1 Reduction in Mark I Torus Program Condensation Oscillation Load Definition and Resulting Effect on Minimum Shell Thickness Requirements," Technical Report TR-7353-1, Revision 1, prepared by Teledyne Engineering Services for Niagara Mohawk Power Corporation, April 1991.

12. "Reduction of Torus Shell Condensation Oscillation Hydrodynamic Loads for Nine Mile Point Unit 1," C.D.I. Technical Note No. 90-11, prepared by Continuum Dynamics, Inc. for Teledyne Engineering Services, November 1990.

13. "FSTF Shell Condensation Oscillation Loading Correction Factors - Uncorrelated Vents," C.D.I. Report No. 79-1, Revision 2, prepared by D.B. Bliss and M.E. Teske of Continuum Dynamics, Inc. for General Electric Company, August 1980.

14. Figure 3 of Reference 12.

15. Table 1 of Reference 12.

16. Table 4.4.1-2 of Reference 1.

17. p. 14 of Reference 12.

18. TES Report TR-5230-1, Rev. 1, "Mark I Containment Program, Plant-Unique Analysis Report of the Torus Suppression Chamber for Nine Mile Point Unit 1 Nuclear Generating Station," dated September 21, 1984.

19. NMC letter NMP1L-0628 from C.D. Terry (VP Nuclear Engineering) to U.S. NRC, dated December 13, 1991.

20. Reference 11 of Reference 10.

List of Acronyms

AC	Acceptance Criteria
BNL	Brookhaven National Laboratory
CO	Condensation Oscillation
FSTF	Full Scale Test Facility
GE	General Electric
LDR	Load Definition Report
NMC	Niagara Mohawk Power Corporation
NMP	Nine Mile Point - Unit 1
NRC	Nuclear Regulatory Commission
NWL	Normal Water Level
PUAR	Plant Unique Analysis Report
SRSS	Square Root of the Sum of Squares

This requirement affects one respondent and, therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,

Original Signed By:
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