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Technical Evaluation Report for the Evaluation of ODCM Revision 8 Nine Mile Point Nuclear Station, Unit 1

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ABSTRACT

The Offsite Dose Calculation Manual (ODCM) for Nine Mile Point Nuclear Station, Unit 1 (NMP-1) contains current methodology and parameters used to calculate offsite doses, dose rates, effluent monitoring alarm setpoints, and conduct the radiological environmental monitoring program. The NRC transmitted the most recent complete NMP-1 ODCM, Revision 8, effective July 1, 1990, to the Idaho National Engineering Laboratory for review by EG&G Idaho, Inc. The ODCM was reviewed by EG&G, and the results are presented in this report. It was determined that the ODCM uses methods that are, in general, within the guidelines of NUREG-0133. However, several significant deficiencies were identified. The following items should be addressed promptly: (a) values of V_i and B_i and/or X/Q should be corrected, (b) gaseous effluent monitor setpoint and dose rate calculation methodology should properly account for simultaneous releases from NMP-2 and JAF, (c) simultaneous releases from liquid waste tanks should be addressed, (d) gaseous dose rates should be determined for the shortest required sampling and analysis intervals, (e) reports should be required to contain more explicit descriptions of the methods used to determine Uranium Fuel Cycle Doses, and (f) NUREG-0473 recommendations for automatic termination of release by effluent monitors and conditions for performing Uranium Fuel Cycle dose calculations should be instituted.

FOREWORD

This report is submitted as partial fulfillment of the "Review of Radiological Issues" project being conducted by the Idaho National Engineering Laboratory for the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation. The U. S. Nuclear Regulatory Commission funded the work under FIN D6034 (Project 5) and NRC B&R Number 20 19 05 03.

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FIGURES

1. INTRODUCTION

1.1 Purpose of Review

This document reports the review and evaluation of the most recent version of the Offsite Dose Calculation Manual (ODCM) submitted by the Niagara Mohawk Power Corporation, the Licensee for the Nine Mile Point Nuclear Station, Unit 1 (NMP-1). The ODCM is a supplementary document for implementing the Radiological Effluent Technical Specifications (RETS) in compliance with 10 CFR 50, Appendix I.[1] This review was performed to assess conformity of the ODCM to the NMP-1 technical specifications and current NRC guidelines.

1.2 Plant Specific Background

The basic ODCM for NMP-1, designated Revision 2, dated February 1986, was transmitted to the Nuclear Regulatory Commission (NRC) February 28, 1986.[2] The NRC reviewed the ODCM and found it to be, in general, acceptable on an interim basis as stated in a letter dated August 22, 1986[3]. Subsequent changes identified as Revisions 3 and 4 were transmitted to the NRC with the Semiannual Effluent Report for the second half of 1986[4] and Revisions 5 and 6 with the Semiannual Effluent Report for the first half of 1988.[5] Revisions 7 and 8 were transmitted to the NRC with the Semiannual Effluent Report for the first half of 1990.[6] The NRC transmitted a complete ODCM, updated through Revision 8, effective July 1, 1990, to the Idaho National Engineering Laboratory (INEL) for review.

The Nine Mile Point Nuclear Station, Unit 1 is a 610 MWe boiling water reactor in the town of Scriba, New York, on the south shore of Lake Ontario. It is approximately 7 miles north-northeast of the city of Oswego, New York, 36 miles north-northwest of Syracuse, New York, and 143.5 miles east-northeast of Buffalo, New York. The site is shared by Nine Mile Point Nuclear Station, Unit 2 (also operated by Niagara Mohawk Power Corporation) and James A FitzPatrick Nuclear Power Plant (owned by the Power Authority of the State of New York).

3. RADIOACTIVE EFFLUENT RELEASE ROUTES

3.1 Liquid Effluent Release Routes

Radioactive liquid effluents from NMP-1 are diluted by the circulating water and then discharged to Lake Ontario. The circulating water flow is provided by two 125,000 gpm (278.5 cfs) pumps. The circulating water intake and outlet are both in Lake Ontario. Technical Specification 3.6.14.a requires radioactivity monitors with alarm setpoints on the following release routes:

1. Liquid Radwaste Effluent Line,
2. Service Water System Effluent Line.

Figure XII-1 of the Updated Final Safety Analysis Report (UFSAR), updated through Revision 9 submitted June 30, 1991[11] shows releases may be made to the circulating water Discharge Tunnel via the Liquid Radwaste Effluent Line from:

1. Floor Drain Sample Tanks (2),
2. Waste Sample Tanks (2), and
3. Laundry Drain Tanks (2).

All normally radioactive liquid wastes are released in batch releases via the Liquid Radwaste Effluent Line. Normally non-radioactive Service Water is released to the circulating water Discharge Tunnel through a separate effluent line. In addition to these routes, ODCM Section 2.3.1 considers releases from the Emergency Condenser Vent that "are assumed to travel to the perimeter drain system and released from the discharge structure at a rate of .33 ft^3/sec."

3.2 Gaseous Effluent Release Routes

The only gaseous radioactive effluent release point used at NMP-1 during normal operation is the Stack, 350 feet (107 meters) above grade.

Technical Specification 3.15.B requires noble gas radioactivity monitors with alarm setpoints on the following routes:

1. Stack Effluent
2. Condenser Air Ejector (Recombiner discharge or air ejector discharge)
3. Emergency Condenser System

Only the Stack monitor directly measures radioactive gaseous effluents at the release point during normal operation. It fulfills the functions of several radioactive effluent monitors identified in Table 3.3-13 of NUREG-0473. The Condenser Air Ejector monitor can provide advance warning of gases to be released via the Stack. The Emergency Condenser monitor is apparently needed only during emergency conditions, such as loss of a.c. power for the main condenser system.

A simple diagram of the gaseous effluent release points, drawn from descriptions in the UFSAR,[11] updated through Revision 9, and the monitoring required by the RETS, is shown in Figure 2.

4. EVALUATION

As stated by the licensee, "The Offsite Dose Calculation Manual (ODCM) provides the methodology to be used for demonstrating compliance with the Radiological Effluent Technical Specifications (RETS), 10 CFR 20, 10 CFR 50, and 40 CFR 190..." and "Section 5 contains a detailed description of the Radiological Environmental Monitoring (REM) sampling locations."

The ODCM is generally complete. However some changes and additions are needed to increase clarity and completeness and to correct errors. One general improvement needed is the addition of a numbering system for the equations, to facilitate referencing and discussion. Readability would be improved if parameters in equations were represented exclusively with defined symbols instead of subscripted units.

4.1 Liquid Effluent Monitor Setpoints

Pursuant to Technical Specification 3.6.14.a, Section 2.1 contains methodology to determine the setpoints of the Service Water System Effluent Line and Liquid Radwaste Effluent Line radioactivity monitors. Technical Specification 3.6.14.a requires the alarm setpoints of the liquid effluent monitors identified in Technical Specification Table 3.6.14-1 to be determined and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the (concentration) limits of Technical Specification 3.6.15.a.1 are not exceeded. Technical Specification 3.6.15.a.1 requires the concentration of radioactive material released in liquid effluents to unrestricted areas to be limited to the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2[12] for radioactive material other than noble gases and to 2×10^{-4} µCi/mL total activity for noble gases.

To be consistent with the recommendations of NUREG-0473, Technical Specification 3.6.14.a and the ODCM should require automatic termination of release by the Liquid Radwaste Effluent Line monitor.

The methodologies of Section 2.1 to calculate setpoints is basically correct, but several changes should be made to accomplish the intended goals, clarify procedures actually used, correct omissions, and improve readability. The recommended changes are discussed in the following paragraphs.

Section 2.1.1 consists partly of a general discussion of setpoints and partly of methodology to determine concentrations for specific monitors. Clarity would be improved if the parts concerning specific monitors were moved to sections that address these monitors (i.e., Sections 2.1.2 and 2.1.3, where the concentrations, $(\mu Ci/ml)_{H\gamma}$ and $(\mu Ci/ml)_{IT}$, are used.

Setpoints for the Service Water System Effluent Line monitors should normally be very low, because the service water is not expected to be radioactive. It is recommended that the setpoints

requires that the dose rate due to noble gases released from the site to areas at and beyond the site boundary shall be limited to less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin. To be consistent with the recommendations of NUREG-0473, Technical Specification 3.6.14.b and the ODCM should require the Condenser Air Ejector monitor to provide automatic termination of release.

Section 3.1.1 consists partly of a general discussion of setpoints and partly of methodology applicable to specific monitors. Clarity would be improved if the parts concerning specific monitors were moved to the sections that address these monitors.

Section 3.1.2 gives the general criteria for determining the setpoint for the Stack noble gas monitor. The concentration limit, $(Q)_{max}$ [µCi/sec], is the concentration that will yield a total body dose of 500 mrem/yr at the site boundary calculated using the dose from an elevated plume. "Hi" and "hi hi" setpoints, respectively, are 0.5 x $(Q)_{max}$ and 0.9 x $(Q)_{max}$ These seem reasonable for a single-unit site and are probably sufficiently low to accommodate releases from the Emergency Condenser Vent. However, the limits appear unreasonably high for the condition that exists at Nine Mile Point; i.e., three units (NMP-1, NMP-2, and JAF) on the site. These setpoints should be reduced so the sum of release rates from all three plants is less than the site limit, or a justification for retaining such high limits should be added. Station responses to hi and hi hi setpoint alarms should be included in the ODCM.

The determination of setpoints based on the total body dose from the elevated plume is probably reasonable, but a more complete justification of the reason for not considering the maximum dose to the skin as possibly limiting should be included in the ODCM.

Comparison of the total body dose rates and gamma air dose rates at the site boundary calculated with the current elevated plume methodology, using V_i's and B_i's from Table 3-2, with the previous methodology, using X/Q times K_i's and M_i's from Tables 3-1 and 3-3, indicates that there is a serious error in at least one of the methodologies. The previous methodology gives higher dose rates. The calculated dose rate should be higher using the elevated plume method than when using the X/Q method, because the rationale for using the elevated plume method is based on the fact that the X/Q method underestimates the dose due to gamma radiation from an elevated plume. A study should be done to determine the validity of the X/Q's, V_i's, and B_i's. Appropriate corrections should then be made in the ODCM.

It should be verified that the maximum dose rates occur at the site boundary, as assumed in the ODCM, and a statement to that effect should be included in Section 3.1.2.

Section 3.1.3 describes the method used to determine the alarm setpoints for the Recombiner Discharge Off-Gas Monitor. The monitor will be set to alarm at discharge rates of 0.5 or 1.0 Ci/sec. The explanation given for these values is that release of the effluent at these rates, without treatment, would result in a total body exposure to an individual at the exclusion area boundary

4.4 Dose Rates Due to Gaseous Effluents

4.4.1 General

The general statement in the first paragraph of Section 3.2 should require determination of dose rates at the shortest intervals for which sampling and analyses are specified in Technical Specification Table 4.6.15-2. This would include: (a) weekly determinations of the organ dose rate due to I-131 and particulates, (b) more frequent determinations when the sampling and analyses required by Note (f) of this table are performed, and (c) when grab samples are analyzed prior to each containment purge.

The discrepancy between the elevated plume and the X/Q calculations discussed in the fourth paragraph in Section 4.2 of this report is pertinent to the calculation of dose rates. If the elevated plume method underestimates the effect of gamma radiation, the calculated gamma total body dose rates will be too low. If the X/Q method overestimates the effect of gamma radiation (because X/Q is too large), the calculated skin dose will be too large. If the X/Q is determined to be too large at the site boundary, it is logical to assume that it is too large for other locations, although there is no internal inconsistency in the ODCM to indicate this.

The discrepancy between the elevated plume and X/Q calculations also has implications for the organ dose rate. If X/Q is erroneously large, the calculated dose rate due to all pathways involving tritium, and the inhalation dose rate due to all radionuclides, will be too large.

For the methodology of Section 3.2 to be within NRC guidelines: (a) the correct value of X/Q's, Vi's, and B_i's should be determined and used in the ODCM, and (b) organ dose rates should be determined based on the weekly and more frequent sampling and analyses of effluents required by Technical Specification 4.6.15-2.

4.4.2 Dose Rates Due to Noble Gases

Pursuant to Technical Specification 4.6.15.b.(1), Section 3.2.1.1 contains methodology to determine that the dose rate due to noble gases is within the limits of Specification 3.6.15.b.(1)(a). Technical Specification 3.6.15.b.(1)(a) requires the dose rate due to noble gases released from the site in gaseous effluents shall to be limited to less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

The equations given in Section 3.2.1.1 to calculate the total body and skin dose rates due to noble gases are the equations for the dose during a calendar year from Section 5.3.1 of NUREG-0133. Instead, they should be the equations for dose rate from Section 5.2.1 of NUREG-0133. The equations now present give dose in mrem, not dose rate in mrem/sec as indicated in the ODCM.

To be within NRC guidelines the licensee's methodology to determine compliance with Technical Specification 3.6.15.b.(1)(b) should require determination of organ dose rates based on the weekly sampling and analyses for I-131 and particulates, and more frequently when required by Note (f) of Technical Specification Table 4.6.15-2. Also, the equation for D_{ak} should be modified to correspond to the dose rate equation in Section 5.2.1 of NUREG-0133, and Q_i should be unambiguously identified as the release rate for the period for which the dose rate is being determined.

4.5 Dose Due To Liquid Effluents

Pursuant to Technical Specification 4.6.15.a.(2), Section 2.3.1 contains methodology to determine the quarterly and annual doses due to the release of radioactive liquid effluents. Technical Specification 3.6.15.a.(2) limits the dose or dose commitment to a member of the public due to radioactive material in liquid effluents released, from each reactor unit, to unrestricted areas, to less than or equal to:

1.5 mrem to the total body during any calendar quarter,
5 mrem to any body organ during any calendar quarter,
3 mrem to the total body during any calendar year, or
10 mrem to any body organ during any calendar year.

The equations of Section 2.3.1 are generally consistent with the methodology of NUREG-0133 and Regulatory Guide 1.109. There are, however, some errors in the discussion of the methodology. The equation for A_{iat}, in Appendix A, is a combination of expressions from NUREG-0133 and Regulatory Guide 1.109. The parts of the equation giving the main part of the dose, for fish and water consumption, are correct. The expression for the dose contribution from shoreline deposits was not verified.

The paragraph below the definitions of terms in the dose equation of Section 2.3.1 states, "A_{iat} values for radwaste liquid batch releases at a discharge rate of 295 ft^3/sec (one circulating water pump in operation) are presented in Tables 1-1 to 1-4." The tables should be given as 2-1 to 2-4; and since no discharge rate is used in the equation for A_{iat}, that part of the statement should be omitted. A tabulation of A_{it} values, which are actually used in the calculation of doses, should be added to the ODCM. The A_{it}'s are dose factors for a "maximum individual." The ODCM describes the maximum individual with the following statement, "This maximum individual is the composite of the highest dose factor A_{iat} of each age group a for each organ t and each nuclide i." This methodology will result in a calculated organ dose that is somewhat too high, but the calculations are simplified considerably, so it is not unreasonable. The reference to Tables 1-1 to 1-8 should be changed to reference Tables 2-1 to 2-8.

4.6.2 Dose Due To Noble Gases

Pursuant to Technical Specification 4.6.15.b.(2), Section 3.2.2.1 contains methodology to determine the gamma and beta air doses due to noble gases released in gaseous effluents. Technical Specification 3.6.15.b.(2) limits the air doses due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the site boundary to:

5 mR/calendar quarter due to gamma radiation,
10 mrad/calendar quarter due to beta radiation,
10 mR/calendar year due to gamma radiation, or
20 mrad/calendar year due to beta radiation.

The units given for Q_i in Section 3.2.2.1 should be changed to (µCi) from (µCi/sec), and it should be noted that the "total quantity" means the quantity released during the period for which the dose is being calculated.

The licensee's methodology to determine the gamma and beta air doses due to gaseous effluents is within NRC guidelines except as noted in Section 4.6.1 above and the need to correct errors in the definition and units of Q_i in the dose equation.

4.6.3 Dose Due To Other Than Noble Gases

Pursuant to Technical Specification 4.6.15.b.(3), Section 3.2.2.2 contains methodology to determine the organ dose due to I-131, I-133, tritium and radionuclides in particulate form with half lives greater than 8 days. Technical Specification 3.6.15.b.(3) limits the organ dose to a member of the public from I-131, I-133, tritium and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the site boundary to less than or equal to 7.5 mrem during any calendar quarter and 15 mrem during any calendar year.

The equation in Section 3.2.2.2 to calculate the organ dose, D_{ak}, is essentially correct. However, the definition of Q_i should be corrected as in Section 3.2.2.1, by changing the units to µCi and identifying the "total quantity" as that associated with the period for which the dose is being determined.

The definition of R_{ijak} for the dose equation in Section 2.2.2 gives units only for pathways using D/Q in the calculation; the units for pathways using X/Q, inhalation pathway and all pathways involving tritium, should also be included.

4.9 Total Dose

Pursuant to Technical Specification 4.6.15.d, Section 4.0 contains methodology to determine cumulative dose contributions from liquid and gaseous effluents and direct radiation from the reactor units and from radwaste storage tanks.

The last sentence of the first paragraph on p. 44 of the ODCM states, "In the event calculations are used, the methodology will be detailed as required in Section 6.9.1.e of the Technical Specifications." This Section requires details of calculations only for doses to members of the public due to their activities inside the site boundary. The ODCM should include a requirement to include details of the calculations of doses for comparison with the 40 CFR 190[13] limits unless the methodology of the ODCM is used.

Section 4 permits the results of radiological environmental sampling and analysis to be used to determine doses to a real member of the public for the purpose of determining if the limits of 40 CFR 190 were exceeded. If this method is utilized, the ODCM should require that all significant details be included in the required report.

Section 4 does not specifically address the calculation of doses due to the release of liquid and gaseous effluents and direct radiation from NMP-1 and JAF. The ODCM should state how these doses are to be determined.

Technical Specification 3.6.15.d requires calculations to determine if the limits of 40 CFR 90 have been exceeded only when calculated doses exceed twice the limits of Technical Specifications 3.6.15.a.2(b), 3.6.15.b.2(b), <u>and</u> 3.6.15.b.3(b). These are the annual limits for doses due to liquid releases, noble gas releases, and releases of gases other than noble gases. The Technical Specifications should be revised to conform to the requirements recommended by NUREG-0473, which require the calculations when calculated doses exceed <u>any</u> of the corresponding quarterly or annual dose limits

The licensee's methodology to determine compliance with the limits of 40 CFR 190 is generally within NRC guidelines except for the lack of methodology to determine doses due to NMP-1 and JAF. However, the details of any dose determinations not performed using the methodology of the ODCM should be required to be included in any report required by Technical Specification 3.6.15.d. Technical Specification 3.6.15.d should be revised to conform more closely to the Specification recommended in NUREG-0473.

5. SUMMARY

Deficiencies and suggestions are summarized below in four categories of decreasing importance. The items in Category A identify the most serious deficiencies, including omissions that cause uncertainty as to whether the proper methodology is used in the ODCM. Category B contains less serious deficiencies, and Category C contains minor deficiencies and editorial recommendations. Category D contains suggestions for changes the licensee may wish to make to simplify calculations, update data, or remove excess conservatism from the methodology. The number in parentheses at the end of each item [e.g., (4.3)] refers to the section in this review that contains a discussion of the item.

Category A. The items in this category should be addressed promptly. Some items identify errors or omissions that result in erroneous calculated doses and dose rates. Others identify omissions or inappropriate values that may result in release rate limits being exceeded or reported doses being insufficiently documented.

1. Section 2.1.4.2 should contain methodology to account for, or prevent, simultaneous releases from the liquid radwaste batch release tanks. (4.1)

2. To be consistent with the recommendations of NUREG-0473, Technical Specification 3.6.14.a and the ODCM should require the Liquid Radwaste Effluent Line monitor to provide automatic termination of release. (4.1)

3. A study should be performed to determine the validity of the X/Q's, V_i's, and B_i's in Tables 3-1 and 3-2, and appropriate corrections should be made in the ODCM. (4.2)

4. To account for releases from NMP-2 and JAF, Section 3.1.2 should require Stack noble gas monitor setpoints that do not permit release rates to exceed the site limit if all three units are releasing noble gases at the rates permitted by their monitor setpoints. (4.2)

5. To be consistent with the recommendations of NUREG-0473, Technical Specification 3.6.14.b and the ODCM should require the Condenser Air Ejector monitor to provide automatic termination of release. (4.2)

6. Section 3.2 should require determination of dose rates at the shortest intervals for which sampling and analyses are specified in Technical Specification Table 4.6.15-2. (4.4.1)

7. Section 3.2.1.1 should include methodology to ensure that the dose rates due to noble gases released by NMP-1 plus the corresponding dose rates due to NMP-2 and JAF releases do not exceed the limits of Technical Specification 3.6.15.b.(1)(a). (4.4.2)

7. Section 3.3 should specify the highest D/Q location for calculation of doses via the vegetation pathway, not the highest D/Q location from which samples are taken (in case samples are not permitted at some locations). (4.6.3)

8. Requirements to project doses comparable to those in NUREG-0473 should be added to Technical Specifications 4.6.16.a and 4.6.16.b, and the corresponding methodology should be added to the ODCM. (4.7)

9, To be consistent with NRC guidelines, the present Figures D-1 through D-12 should be replaced with legible simplified flow diagrams. (4.8)

10. Section 4 should specify that required reports will include details of the calculations of doses for comparison with the 40 CFR 190 limits unless the methodology of the ODCM is used. (4.9)

11. Section 2.1.2 should require the setpoints of the Service Water System Effluent Line monitor to be set at a low multiple of background if the releases are not radioactive. (4.1)

12. Note (a) at the end of Section 2.1.3 should be made applicable to Section 2.1.2. when the setpoints are based on measured activity in the service water. (4.1)

13. The discussion in the last paragraph of Section 2.1.4.3 should be correlated with Note (a) at the end of Section 2.1.3. (4.1)

14. In Section 3.1.3, it would be appropriate to determine the setpoints of the Recombiner Discharge Off-Gas Monitor on the basis of offsite dose rates after the gases are released through the charcoal column instead of the exposure resulting from failure of the system. (4.2)

15. Section 3.1.4 should contain more detailed methodology to determine the setpoint of the Emergency Condenser Vent monitor based on calculated dose rates at the site boundary if the Emergency Condenser is used in non-emergency conditions. (4.2)

Category C. The items in this category indicate omissions and editorial deficiencies that are not likely to cause significant problems:

1. To improve readability, a numbering system should be used for the equations. (4)

2. To improve readability, the "(units)" used for values in the liquid setpoint and concentration equations should be replaced by appropriate symbols. (4)

Category D. The following items concern methodology and parameters that the licensee may wish to change because the change may simplify calculations, remove unnecessary conservatism in the calculations, or make use of recent data:

1. If the Emergency Condenser is used only in emergency conditions, the licensee may wish to remove the requirement for this monitor from Technical Specification 4.6.14. (4.2)

2. The licensee may wish to consider revising Section 3.2.1.2 so compliance with Technical Specification 3.6.15.b.(1)(b) is achieved by showing that the thyroid dose rate to a child via the inhalation pathway is restricted to less than or equal to 1500 mrem/yr, as is permitted by the basis statements in the licensee's RETS and NUREG-0473. (4.4.3)

7. REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, "Domestic Licensing of Production and Utilization Facilities"

2. Letter from T. E. Lempges (Niagara Mohawk Corporation) to T. E. Murley (NRC), Subject: Nine Mile Point Nuclear Station, Unit 1 Semiannual Effluent Release Report, July-December 1985; February 28, 1986.

3. Letter from J. A. Zwolinske (NRC) to C. V. Mangan (Niagara Mohawk Power Corporation), Subject: Acceptance of Revision 2 to the Offsite Dose Calculation Manual; August 22, 1986.

4. Letter from T. E. Lempges (Niagara Mohawk Power Corporation) to W. T. Russel (NRC), Subject: Nine Mile Point Nuclear Station, Unit 1 Semiannual Effluent Release Report, July-December 1986; March 2, 1987.

5 Letter from T. J. Perkins (Niagara Mohawk Power Corporation) to U.S. Nuclear Regulatory Commission, Subject: Nine Mile Point Nuclear Station, Unit 1 Semiannual Effluent Release Report, January-June 1988; August 30, 1988.

6. Letter from J. F. Firlit (Niagara Mohawk Power Corporation) to Document Control Desk (NRC), Subject: Nine Mile Point Unit #1/Docket No. 50-220/DPR-63; August 30, 1990.

7. "Standard Radiological Effluent Controls for Boiling Water Reactors"; NUREG-0473, Revision 3, Draft 9, August 28, 1989.

8. "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, A Guidance Manual for Users of Standard Technical Specifications," NUREG-0133, October 1978.

9. "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50", Regulatory Guide 1.109, Revision 1, October 1977.

10. "General Contents of the Offsite Dose Calculation Manual", Revision 1, Branch Technical Position, Radiological Assessment Branch, NRC, February 8, 1979.

11. Letter from S. W. Wilcaek, Jr. (Niagara Mohawk Power Corporation) to Document Control Desk (NRC); Re: Nine Mile Point Unit 1/Docket No. 50-220/DPR-63; June 28, 1991.

12. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."

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SEE INSTRUCTIONS ON THE REVERSE.

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12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

The Offsite Dose Calculation Manual (ODCM) for Nine Mile Point Nuclear Station, Unit 1 (NMP-1) contains current methodology and parameters used to calculate offsite doses, dose rates, effluent monitoring alarm setpoints, and conduct the radiological environmental monitoring program. The NRC transmitted the most recent complete NMP-1 ODCM, Revision 8, effective July 1, 1990, to the Idaho National Engineering Laboratory for review by EG&G Idaho, Inc. The ODCM was reviewed by EG&G, and the results are presented in this report. It was determined that the ODCM uses methods that are, in general, within the guidelines of NUREG-0133. However, several significant deficiencies were identified. The following items should be addressed promptly: (a) values of V_i and B_i and/or X/Q should be corrected, (b) gaseous effluent monitor setpoint and dose rate calculation methodology should properly account for simultaneous releases from NMP-2 and JAF, (c) simultaneous releases from liquid waste tanks should be addressed, (d) gaseous dose rates should be determined for the shortest required sampling and analysis intervals, (e) reports should be required to contain more explicit descriptions of the methods used to determine Uranium Fuel Cycle Doses, and (f) NUREG-0473 recommendations for automatic termination of release by effluent monitors and conditions for performing Uranium Fuel Cycle dose calculations should be instituted.

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