

NOV 27 1985

DOCKET NO: 70-2948

APPLICANT: Niagara Mohawk Power Corporation
Central Hudson Gas and Electric Corporation
Long Island Lighting Company
New York State Electric and Gas Corporation
Rochester Gas and Electric

FACILITY: Nine Mile Point Nuclear Station (NMP), Unit 2

SUBJECT: SAFETY EVALUATION REPORT - REVIEW OF LICENSE APPLICATION DATED
JUNE 12, 1985, AND SUPPLEMENTS THERETO DATED SEPTEMBER 27,
OCTOBER 22, OCTOBER 29, AND NOVEMBER 18, 1985

I. INTRODUCTION

A. General

By application dated June 12, 1985, and supplements dated September 27, October 22, October 29, and November 18, 1985, Niagara Mohawk, acting on its own behalf and as agent for the above co-owners, requested an amendment to its License No. SNM-1895 to authorize the receipt, possession, inspection, and storage of fuel assemblies containing uranium enriched up to 3.05 w/o. The present license only authorizes the receipt, storage and installation in the reactor vessel and preoperational testing of neutron detectors.

The fuel assemblies will be supplied by General Electric Corporation. Each fuel assembly contains 62 fuel rods and 2 nonfuel rods called water rods. The rods are spaced and supported in a square 8X8 array, by the upper and lower tie plates, and by 7 fuel spacer grids. Table 1 gives general fuel rod parameters that describe the fuel that will eventually be used at Nine Mile Point, Unit 2. The materials license was requested to allow early receipt of the fuel for reactor loading. The license will automatically terminate upon issuance of the Part 50 operating license for Unit 2.

Table 1
Parameters

Fuel Assembly Data:

Overall Length 176.16"
Nominal Active Fuel Length 150.0"
Fuel Rod Pitch 0.640"
Rod Array 8X8
Rods/Assembly 64 (includes 2 water rods)

Fuel Rod Data:

Fuel Pellet Material	UO ₂ + UO ₂ /Gd ₂ O ₃
Clad Outside Diameter	0.483"

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Table 1 (CONTINUED)

Clad Thickness	0.032"
Clad Inside Diameter	0.419"
Fuel Pellet Immersion Density	95.0% theoretical
Fuel Pellet Diameter	0.410"
Maximum Pin Enrichment	3.05 w/o U-235
Maximum Quantity U-235	4.01 kg U-235/183.2 kg U @ 2.19 w/o

B. Location Description

The NMP, Unit 2, is a Boiling Water Reactor located on the southwest shore of Lake Ontario in Oswego County, New York. The construction permit, CPPR-112, was issued in June 1972 (Docket No. 50-410).

II. AUTHORIZED ACTIVITIES

The applicants' request authorization to receive, possess, and store 800 finished fuel assemblies with a maximum pin enrichment of 3.05 w/o in U-235. Fuel assemblies will be stored in the New Fuel Storage Facility and/or the Spent Fuel Storage Facility in the Reactor Building. The designated fuel storage areas in each are the New Fuel Storage Vault in the New Fuel Storage Facility and the Spent Fuel Storage Pool racks in the Spent Fuel Storage Facility. The fuel assemblies, in their shipping containers, will be temporarily stored in the receiving area and on the refueling floor. The applicants also request authorization to repackage any assembly, if necessary, for delivery to a carrier. It should be noted that the license does not authorize insertion of a fuel assembly into the reactor vessel. The licensee is currently authorized to receive, store, install, and pretest neutron detectors.

III. SCOPE OF REVIEW

The safety review of the Niagara Mohawk request for a materials license amendment includes an evaluation of Nine Mile Point's organization, administration, nuclear criticality safety, radiation protection, physical security, and fire protection programs. During the review, discussions were held with the NRR Project Manager, the Resident Inspector, Region I, and with staff members of the applicant. The NMP Security Plan was evaluated by the Safeguards Material Licensing and International Activities Branch, Division of Safeguards, Office of Nuclear Material Safety and Safeguards.

IV. POSSESSION LIMITS

Conditions 6, 7, and 8 of the license specify the type, form, and quantity of material the licensee may possess at any one time under this license and shall read as follows:

6. <u>Material</u>	7. <u>Form</u>	8. <u>Quantity</u>
A. Uranium enriched in the U-235 isotope	A. In unirradiated reactor fuel assemblies	A. 2800 kg of U-235 in uranium enriched to no more than 3.05 w/o in U-235
B. Uranium enriched in the U-235 isotope	B. Contained in sealed neutron detectors	B. One (1) gram of U-235 at any enrichment

V. ORGANIZATION

A. Nuclear Criticality Safety and Radiation Protection Responsibilities

1. General Superintendent Nuclear Generation

The General Superintendent is directly responsible for the safe and efficient operation of the plant and its equipment. He is responsible for compliance with all NRC regulations and license conditions.

2. Station Superintendent

All receipt, shipment, and internal transfer of special nuclear material in the form of fuel assemblies will be performed in accordance with approved fuel handling procedures, under the control of the Station Superintendent. He is responsible for preparation and approval of fuel handling procedures.

3. Reactor Analyst Supervisor

The Reactor Analyst Supervisor approves the fuel handling procedures. He provides guidance for fuel management and maintains performance and fuel accountability records.

4. Superintendent of Chemistry and Radiation Management

The Superintendent of Chemistry and Radiation Management (Radiation Protection Manager - RPM) is responsible for establishing the Health Physics Program and developing health physics procedures for NMP-2 that are designed to assure compliance with applicable regulations, licenses, and regulatory guides. In addition, he provides technical guidance for conducting this program, audits the effectiveness and the result of the program, and modifies it as required.

5. Supervisor of Chemistry and Radiation Protection

The Supervisor of Chemistry and Radiation Protection is responsible for conducting the Health Physics Program for NMP, Unit 2. His duties include the training of personnel in radiation safety, control of radiation exposures to personnel to maintain exposure levels that are as low as reasonably achievable, to continuously evaluate and review the radiological status of the station, and to make recommendations for control or elimination of radiation hazards.

B. Minimum Qualifications

The qualifications of the aforementioned personnel have been reviewed and the staff finds they meet the minimum qualifications specified in Regulatory Guide 1.8, "Personnel Selection and Training" or ANSI/ANS 3.1-1978, "Selection and Training of Nuclear Power Plant Personnel" or both; however, the applicants have not clearly specified minimum qualifications for these positions. Accordingly, Condition Nos. 11-15 are recommended to correct this deficiency and shall read as follows:

- Condition 11. The minimum technical qualifications for the General Superintendent Nuclear Generation shall be in accordance with Section 4.2.1, "Plant Manager," ANSI/ANS 3.1-1978.
- Condition 12. The minimum technical qualifications for Station Superintendent shall be in accordance with Section 4.2.1, "Plant Manager," ANSI/ANS 3.1-1978.
- Condition 13. The minimum technical qualifications for the Reactor Analyst Supervisor shall be in accordance with Section 4.4.1, "Reactor Engineer," ANSI/ANS 3.1-1978.
- Condition 14. The minimum technical qualifications for the Superintendent of Chemistry and Radiation Management shall be in accordance with the requirements for "Radiation Protection Manager," Regulatory Guide 1.8, September 1975.
- Condition 15. The minimal technical qualifications for the Supervisor of Chemistry and Radiation Protection shall be in accordance with the requirements for "Radiation Protection Manager," Regulatory Guide 1.8, September 1975.

C. Training

Training is conducted to ensure that all personnel involved in fuel handling participate in a formal training program. The overall training program for the plant staff is the responsibility of the General Superintendent Nuclear Generation. All persons entering the restricted area of the station receive training pursuant to 10 CFR 19.12. This training is the responsibility of the Supervisor of Chemistry and Radiation Protection. Radiation Protection Technicians receive training in the use of equipment and procedures for dealing with radiological concerns and job-related accidents. All personnel involved in fuel receipt receive basic training in radiation protection and the site emergency plan. In order to ensure that all persons involved in fuel handling receive training in all fuel handling operations, the staff recommends that License Condition 16 be added to supplement Niagara Mohawk's training program.

- Condition 16. The following training shall be completed by each individual prior to participation in the radiation safety and/or fuel handling programs:

- (a) All radiation safety personnel involved in fuel handling shall be trained in radiation safety and in NMP's Unit 2, radiation protection procedures related to fuel assembly handling.
- (b) All operations personnel involved in fuel handling shall receive training in proper fuel handling procedures, including the related health and safety aspects of the activities.

D. Administrative Procedures

Procedures for the control and handling of nuclear fuel are reviewed by the Chemistry and Radiation Management and Operations departments. These procedures are approved by the General Superintendent, the Station Superintendent, and the Reactor Analyst Supervisor.

The Superintendent of Chemistry and Radiation Management establishes the Health Physics Program and develops the health physics procedures for NMP-2. The Supervisor of Chemistry and Radiation Protection is responsible for conducting the Health Physics Program, and the Radiation Protection Technicians perform the required radiation monitoring and exposure control work in accordance with radiation protection instructions prepared by the Radiation Protection Supervision.

VI. NUCLEAR CRITICALITY SAFETY

A. General

The fuel assemblies will be stored in their shipping containers in the fuel receiving area, on the refueling floor, in the New Fuel Storage Vault, and in the Spent Fuel Storage Facility of the Reactor Building. The New Fuel Storage racks can accommodate up to 270 new fuel assemblies utilizing all storage rack positions. The Spent Fuel Storage Pool racks have positions for approximately 4,000 fuel assembly storage spaces. In both the New Fuel Storage Vault and the Spent Fuel Storage Facility, spaces between the fuel storage positions are designed so it is not possible to insert a fuel assembly in any array position not intended for fuel.

B. Shipping Containers

The fuel assemblies may be temporarily stored in their shipping containers on the refueling floor of the Reactor Building and in the fuel receiving area. On the refueling floor, the assemblies will be stored in their inner metal containers only, i.e., without their wooden overpacks. Niagara Mohawk requests authorization to store fuel assemblies in these containers in arrays stacked up to three high. The staff has previously confirmed the nuclear criticality safety of an infinite shipping container storage array stacked 3 high*. Accordingly, the staff recommends the following condition for emphasis:

*Reference Amendment No. 5 to General Electric's Materials License No. SNM-1097, dated June 6, 1978, Docket No. 70-1113.

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- Condition 17. Fuel assemblies, when stored in their shipping containers, shall be stacked no more than three containers high.

C. Fuel Handling

The applicants' application states that no more than four fuel assemblies will be out of their containers or storage rack locations at a given time. A maximum of three assemblies will be above the refueling floor and the fourth assembly shall be below the refueling floor in the Spent Fuel Pool confines. Calculations have indicated that three assemblies out of storage cannot be made critical under any conditions. In addition, the applicants are committed to maintaining a minimum edge-to-edge distance of >12 inches between fuel assemblies out of storage and fuel assemblies in their shipping container array and the storage rack arrays.

It is recommended that the following conditions be added to emphasize nuclear criticality safety for fuel assemblies out of authorized storage locations or shipping containers by: (1) limiting the number of fuel assemblies out of approved storage locations, and (2) maintaining a minimum edge-to-edge distance between fuel out of storage and from all other fuel.

- Condition 18. All fuel assemblies shall be in their shipping containers or storage racks in the New Fuel Vault or in the Spent Fuel Storage Facility except for the following:

- a. No more than three assemblies shall be allowed above the refueling floor.
- b. No more than one fuel assembly shall be below the refueling floor outside the storage racks.

- Condition 19. The above four fuel assemblies shall maintain a minimum edge-to-edge spacing of twelve (12) inches from the shipping container array and approved storage rack locations.

In order to be sure the fuel handling equipment is ready to safely handle the fuel assemblies, the applicants have stated that prior to use for handling new fuel, preoperational testing of fuel handling equipment will be performed in accordance with approved procedures. To emphasize the applicant's commitment and to ensure testing prior to use, the following condition has been added:

- Condition 20. All preoperational testing of fuel handling equipment shall be completed prior to use for handling the new fuel shipment.

D. New Fuel Storage Vault

The New Fuel Storage Vault has the capacity to provide dry storage for 270 channeled and/or unchanneled new fuel assemblies. The vault contains 27 sets of racks constructed of aluminum guidetubes. Each storage rack provides support

and storage for a row of 10 fuel assemblies. The minimum center-to-center spacing for fuel assemblies between rows is 11 inches. The minimum center-to-center spacing within rows is 7.00 inches.

Criticality analysis of the above new fuel storage vault indicates it can be made critical at optimum water density moderation. To maintain criticality safety of the New Fuel Storage Vault, the applicants propose to eliminate sources of water moderation from the New Fuel Storage Vault. This is accomplished by the presence of 32 aluminum cover plates over the new fuel assembly racks. Each cover plate covers 10 fuel assemblies. Administrative controls limit the maximum number of fuel assemblies that will be uncovered at any one time to 10.

The staff has determined that 10 fresh fuel assemblies in a single row, based upon the above spacing between fuel assemblies, cannot be made critical under any degree of water moderation. It is recommended that the following license condition be added to highlight the importance of having only a maximum of 10 fresh fuel assemblies uncovered at any one time in the New Fuel Storage Vault.

Condition 21. The New Fuel Storage Vault shall have no more than 10 fresh fuel assemblies uncovered at any one time.

E. Spent Fuel Storage Pool

The spent fuel storage racks are composed of a honeycomb array of identical stainless steel cells. The cells are spaced on a 6.180 inch center and are lined with 0.110-inch thick stainless steel. Each cell has an inside clearance of 5.854 inches to accommodate an 8X8 fuel assembly channeled in 0.100-inch thick zircaloy.

Subcriticality of the spent fuel storage pool is maintained by the presence of neutron poison sheets (Boraflex) placed on all four sides of each storage cell. In addition, in the east west direction, each storage rack has a sheet of neutron poison placed between it and the adjacent rack. In the north south direction, a 3-inch water gap having an equivalent effect is present between adjacent storage racks. The staff has reviewed the applicant's quality assurance program to ensure that the neutron poison meets design specifications and is positioned securely to the walls of the storage cells. The program was found to be adequate.

An independent nuclear criticality safety analysis of the spent fuel storage pool performed by the staff indicates a k-infinity of 0.91 for an infinite array of fresh fuel assemblies at an enrichment of 3.05 w/o U-235 and at full water density (optimum moderation). Therefore, the array is safe.

F. Exemption from 10 CFR Part 70.24

The applicants have requested, pursuant to 10 CFR 70.24 (d), an exemption from the provisions of 10 CFR 70.24. Because the assemblies are handled as discrete items, they are stored with engineered controlled spacing, they are normally stored dry (cannot be made critical independent of quantity), and even under accident conditions involving flooding with water, administrative controls limit the number of assemblies that can be moderated at one time. The limited

quantities of sealed incore monitoring detectors cannot be made critical under any conditions. Therefore, the staff determines that granting such an exemption will not endanger life, property, or the common defense and security, is otherwise in the public interest, and is authorized by law. The staff recommends that pursuant to 10 CFR 70.14, Condition 22 shall read as follows:

Condition 22. The licensee is hereby exempted from the provisions of 10 CFR 70.24 insofar as this exemption applies to materials held under this license only.

VII. RADIATION SAFETY

All the materials requested in this application are sealed or contained sources. Therefore, the potential for generating airborne radioactivity from the material is minimal and the principal pathway for radiation exposure to an individual is via the external radiation. Personnel external exposures are monitored as required by 10 CFR 20.202. This is done by using thermoluminescent dosimeters, film badges, and self-reading pocket dosimeters.

The external radiation dose to personnel is determined on a daily basis by means of self-reading pocket dosimeters. Personnel monitoring badges (film badges and TLD's) are processed at least twice per month. Records of radiation exposure history and current occupational exposure are maintained for each individual for whom personnel monitoring is required. Portable radiation survey and monitoring instruments for routine use are calibrated quarterly. Proofs of calibration are also maintained. Neutron exposure is monitored in accordance with Regulatory Guide 8.14 through the use of dose rate/stay time calculations or neutron/gamma dose rate ratios.

The staff has concluded that the Nine Mile Point, Unit 2, Health Physics Program is adequate for the protection of Nine Mile Point, Unit 2 personnel, the public, and the environment.

Condition Nos. 11-15 of the original license are to be incorporated into the revised license as Condition Nos. 23-27. These conditions were discussed in the Safety Evaluation Reports (related to the original license) dated April 19, 1982, and May 8, 1985.

- Condition 23. Records of the daily visual surveillance of the shipping containers with the neutron detectors shall be maintained and a copy of each surveillance submitted to the Superintendent Chemistry and Radiation Management and the Nine Mile Point, Reactor Analyst Supervisor.
- Condition 24. The licensee shall repackage fuel in accordance with 10 CFR Part 71 prior to delivery to a carrier for transport.
- Condition 25. Procedures for the handling and installation of the neutron detectors in the reactor vessel shall be approved by the Superintendent, Chemistry and Radiation Management.

- Condition 26. A member of the Chemistry and Radiation Management staff shall be present during all neutron detector handling operations and shall monitor these activities.
- Condition 27. The licensee shall maintain records of the contamination survey (smear survey) results for both the neutron detector containers and the fuel assembly shipping crates.

VIII. ENVIRONMENTAL PROTECTION

The Final Environmental Statement related to the operation of Nine Mile Point, Unit 2, dated May 1985 has been prepared and issued by the NRC as NUREG-1085. An environmental assessment has also been prepared for the 10 CFR Part 70 Fuel Storage License in accordance with 10 CFR 51.21. This assessment supports a Finding of No Significant Impact which was published in the Federal Register on November 8, 1985.

IX. FIRE SAFETY

There is a manual fire fighting system in the New Fuel Storage Vault. Dry chemical or CO₂ and halon fire extinguishers are provided and the area is normally free of combustible material. However, hose stations are provided for fighting fires which could occur in the fuel receiving area. Training and administrative controls will preclude the fire fighting crews from using the hose stations to spray water into the new fuel vault or from spraying the fuel receiving areas if new fuel is being transferred from the shipping container to its storage location. The staff has concluded that the Nine Mile Point, Unit 2 Nuclear Station, fire protection measures are adequate for the facility.

X. PHYSICAL PROTECTION

The Division of Safeguards, NMSS, has reviewed Niagara Mohawk's Physical Security Plan and has determined that it meets the requirements of 10 CFR 73.67. To ensure that the Physical Security Plan shall be fully implemented and remain in effect whenever fresh fuel is stored onsite, the staff recommends Condition 28.

- Condition 28. The licensee shall maintain and fully implement all provisions of the Commission approved Physical Security Plan, including changes made pursuant to the authority of 10 CFR 70.32(e). The approved Security Plan is titled "Nine Mile Point Nuclear Station Unit #2, Security Plan for Special Nuclear Material of Low Strategic Significance, Revision 1" dated August 1985. The Physical Security Plan shall be withheld from public disclosure pursuant to 10 CFR 2.790(d).

XI. CONCLUSIONS

1. After reviewing the application and its supplement, the staff finds that:
 - a. The application meets the requirements of the Atomic Energy Act, as amended, and of the regulations of the Commission,

- b. Issuance of the license would not be inimical to the common defense and security, and
 - c. Issuance of the license would not constitute an unreasonable risk to the health and safety of the public.
2. With the recommended license conditions, the NRC staff finds that:
- a. The applicants are qualified by reason of training and experience to use the material for the purpose requested in accordance with the regulations in 10 CFR 70.23.
 - b. The applicants' proposed equipment and facilities are adequate to protect health and minimize danger to life or property.
 - c. The applicants' proposed procedures to protect health and to minimize danger to life or property are adequate.

XII. RECOMMENDATIONS

The staff recommends approval of the application and its supplements subject to the following conditions which the staff finds are appropriate to protect health or to minimize danger to life or property:

- Condition 11. The minimum technical qualifications for the General Superintendent Nuclear Generation shall be in accordance with Section 4.2.1, "Plant Manager," ANSI/ANS 3.1-1978.
- Condition 12. The minimum technical qualifications for Station Superintendent shall be in accordance with Section 4.2.1, "Plant Manager," ANSI/ANS 3.1-1978.
- Condition 13. The minimum technical qualifications for the Reactor Analyst Supervisor shall be in accordance with Section 4.4.1, "Reactor Engineer," ANSI/ANS 3.1-1978.
- Condition 14. The minimum technical qualifications for the Superintendent of Chemistry and Radiation Management shall be in accordance with the requirements for "Radiation Protection Manager," Regulatory Guide 1.8, September 1975.
- Condition 15. The minimum technical qualifications for the Supervisor of Chemistry and Radiation Protection shall be in accordance with the requirements for "Radiation Protection Manager," Regulatory Guide 1.8, September 1985.
- Condition 16. The following training shall be completed by each individual prior to participation in the radiation safety and/or fuel handling programs:

- (a) All radiation safety personnel involved in fuel handling shall be trained in radiation safety and in NMP's Unit 2, radiation protection procedures related to fuel assembly handling.
 - (b) All operations personnel involved in fuel handling shall receive training in proper fuel handling procedures, including the related health and safety aspects of the activities.
- Condition 17. Fuel assemblies, when stored in their shipping containers, shall be stacked no more than three containers high.
- Condition 18. All fuel assemblies shall be in their shipping containers or storage racks in the New Fuel Vault or in the Spent Fuel Storage Facility except for the following:
 - a. No more than three assemblies shall be allowed above the refueling floor.
 - b. No more than one fuel assembly shall be below the refueling floor outside the storage racks.
- Condition 19. The above four fuel assemblies shall maintain a minimum edge-to-edge spacing of twelve (12) inches from the shipping container array and approved storage rack locations.
- Condition 20. All preoperational testing of fuel handling equipment shall be completed prior to use for handling the new fuel shipment.
- Condition 21. The New Fuel Storage Vault shall have no more than 10 fresh fuel assemblies uncovered at any one time.
- Condition 22. The licensee is hereby exempted from the provisions of 10 CFR 70.24 insofar as this exemption applies to materials held under this license only.
- Condition 23. Records of the weekly visual surveillance of the shipping containers with the neutron detectors shall be maintained and a copy of each surveillance submitted to the Superintendent Chemistry and Radiation Management and the Nine Mile Point, Reactor Analyst Supervisor.
- Condition 24. The licensee shall repackage fuel in accordance with 10 CFR Part 71 prior to delivery to a carrier for transport.
- Condition 25. Procedures for the handling and installation of the neutron detectors in the reactor vessel shall be approved by the Superintendent, Chemistry and Radiation Management.

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- Condition 26. A member of the Chemistry and Radiation Management staff shall be present during all neutron detector handling operations and shall monitor these activities.
- Condition 27. The licensee shall maintain records of the contamination survey (smear survey) results for both the neutron detector containers and the fuel assembly shipping crates.
- Condition 28. The licensee shall maintain and fully implement all provisions of the Commission approved Physical Security Plan, including changes made pursuant to the authority of 10 CFR 70.32(e). The approved Security Plan is titled "Nine Mile Point Nuclear Station Unit #2, Security Plan for Special Nuclear Material of Low Strategic Significance, Revision 1" dated August 1985. The Physical Security Plan shall be withheld from public disclosure pursuant to 10 CFR 2.790(d).

Original Signed By:
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