

July 24, 1995

Mr. T. Gary Broughton, Vice President
and Director - TMI-1
GPU Nuclear Corporation
Post Office Box 480
Middletown, PA 17057

SUBJECT: ISSUANCE OF AMENDMENT - TSCR NO. 251 (TAC NO. M92441)

Dear Mr. Broughton:

The Commission has issued the enclosed Amendment No. 194 to Facility Operating License No. DPR-50 for the Three Mile Island Nuclear Station, Unit No. 1 (TMI-1), in response to your letter dated June 1, 1995.

The amendment revises the TMI-1 Technical Specifications to allow the use of two zirconium-based advanced fuel rod cladding materials manufactured by the Babcock & Wilcox Fuel Company. Your letter also requested an exemption from the requirements of 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR 50. The staff has determined that, because the clad material to be used in these test assemblies is neither zircaloy nor ZIRLO, these regulations do not apply and, therefore, an exemption is not required.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,
Original signed by

Ronald W. Hernan, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-289

- Enclosures: 1. Amendment No. 194 to DPR-50
2. Safety Evaluation

cc w/encls: See next page

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* See previous concurrence

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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

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Sincerely,

A handwritten signature in black ink that reads "Ronald W. Hernan".

Ronald W. Hernan, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-289

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2. Safety Evaluation

cc w/encls: See next page

G. Broughton
GPU Nuclear Corporation

Three Mile Island Nuclear Station,
Unit No. 1

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

METROPOLITAN EDISON COMPANY

JERSEY CENTRAL POWER & LIGHT COMPANY

PENNSYLVANIA ELECTRIC COMPANY

GPU NUCLEAR CORPORATION

DOCKET NO. 50-289

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 194
License No. DPR-50

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by GPU Nuclear Corporation, et al. (the licensee) dated June 1, 1995, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.c.(2) of Facility Operating License No. DPR-50 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No.194 , are hereby incorporated in the license. GPU Nuclear Corporation shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Phillip F. McKee, Director
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: July 24, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 194

FACILITY OPERATING LICENSE NO. DPR-50

DOCKET NO. 50-289

Replace the following page of the Appendix A, Technical Specifications, with the attached page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove

5-4

Insert

5-4

5.3 REACTOR

Applicability

Applies to the design features of the reactor core and reactor coolant system.

Objective

To define the significant design features of the reactor core and reactor coolant system.

Specification

5.3.1 REACTOR CORE

- 5.3.1.1 A fuel assembly normally contains 208 fuel rods arranged in a 15 by 15 lattice. The reactor shall contain 177 fuel assemblies. Fuel rods shall be clad with zircaloy, ZIRLO, or BWFC zirconium-based M4 or M5 alloy materials and contain an initial composition of natural or slightly enriched uranium dioxide as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with NRC-approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff-approved codes and methods, and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core regions. The details of the fuel assembly design are described in TMI-1 UFSAR Chapter 3.
- 5.3.1.2 The reactor core shall approximate a right circular cylinder with an equivalent diameter of 128.9 inches. The active fuel height is defined in TMI-1 UFSAR Chapter 3.
- 5.3.1.3 The core average and individual batch enrichments for the present cycle are described in TMI-1 UFSAR Chapter 3.
- 5.3.1.4 The control rod assemblies (CRA) and axial power shaping rod assemblies (APSRA) are distributed in the reactor core as shown in TMI-1 FSAR Chapter 3. The CRA and APSRA design data are also described in the UFSAR.
- 5.3.1.5 The TMI-1 core may contain burnable poison rod assemblies (BPRA) and gadolinia-urania integral burnable poison fuel pellets as described in TMI-1 UFSAR Chapter 3.
- 5.3.1.6 Reload fuel assemblies and rods shall conform to design and evaluation data described in the UFSAR. Enrichment shall not exceed a nominal 5.0 weight percent of U_{235} .

5.3.2 REACTOR COOLANT SYSTEM

- 5.3.2.1 The reactor coolant system shall be designed and constructed in accordance with code requirements. (Refer to UFSAR Chapter 4 for details of design and operation.)



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 194 TO FACILITY OPERATING LICENSE NO. DPR-50

METROPOLITAN EDISON COMPANY

JERSEY CENTRAL POWER & LIGHT COMPANY

PENNSYLVANIA ELECTRIC COMPANY

GPU NUCLEAR CORPORATION

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated June 1, 1995, the GPU Nuclear Corporation (GPUN, the licensee) submitted a request for changes to the Three Mile Island Nuclear Station, Unit 1 (TMI-1) Technical Specifications (TSs). The requested changes would revise the TMI-1 TSs to describe the use of two zirconium-based advanced fuel rod cladding materials. TMI-1 Technical Specification Section 5.3.1.1 currently specifies that fuel rods be clad with zircaloy or ZIRLO. The advanced fuel rod cladding materials being considered are manufactured by the Babcock & Wilcox Fuel Company (BWFC) and are designated M4 and M5. These materials have metallurgical compositions outside the zircaloy or ZIRLO specifications. This change would allow use of the two advanced zirconium alloy fuel rod cladding materials in TMI-1 Cycle 11 and subsequent cycles. These claddings will be initially irradiated in peripheral rod locations in two Mark B10 fuel assemblies. Each of the two test assemblies will contain eight advanced cladding fuel rods (four M4 and four M5).

2.0 EVALUATION

GPUN's June 1, 1995, submittal included Topical Report BAW-2133P entitled "MARK-BW Advanced Claddings Fuel Rod Evaluation" and a report entitled "Evaluation of M4 and M5 Cladding Alloys for TMI-1," both prepared by (BWFC). The advanced cladding materials being considered for TMI-1 are M4 and M5 type cladding. These materials are being irradiated in the reactor core at McGuire Unit 1 and have been used in European reactors. Post-irradiation examination results after the first and second cycles at McGuire Unit 1 indicate the materials are performing well. The licensing basis for the McGuire Unit 1 demonstration assemblies is documented in Topical Report BAW-2133P. The M4 alloy is identical to the F3 alloy that was evaluated in BAW-2133P. The M5 alloy is identical in chemical composition to the F4 alloy described in BAW-2133P, but was subjected to a slightly different temperature in the final

anneal process. This slight temperature difference produces a more uniform homogeneous microstructure which further enhances the corrosion properties of the material. The advanced clad materials will be irradiated at TMI-1 for three cycles, beginning with the Cycle 11 reload in September 1995. This demonstration program is being conducted to determine how various clad materials react under in-reactor conditions to support improved fuel assembly performance at higher fuel burnups and residence times. Each of the rods to be tested is expected to perform at least as well as the current fuel design.

The non-Zircaloy-4 clad types to be utilized in the TMI-1 Cycle 11 core have been tested for corrosion resistance, tensile and burst strength, and creep characteristics. Details concerning the test programs that have been performed in support of this demonstration are described in BAW-2133P. GPUN provided nuclear, mechanical, thermal and LOCA evaluations that demonstrate the acceptability of the advanced cladding fuel rods in TMI-1 Cycles 11, 12, and 13. The fuel rods are shown by these evaluations to meet all established design criteria and will operate safely during those cycles. The demonstration assemblies meet the same design bases as the fuel which is currently in the reactor. No safety limits have been changed or setpoints altered as a result of the use of these assemblies. The FSAR analyses are bounding for the demonstration assemblies as well as the remainder of the core.

The demonstration assemblies will be placed in core locations which will allow them to accumulate approximately 45 to 50 GWD/MTU during three cycles of exposure. Based on current cycle design projections the advanced cladding rods will reach burnups up to 53 GWD/MTU. The assemblies will be placed in core locations which will not experience limiting power peaking in any cycle. Following each cycle, the demonstration assemblies will undergo a post-irradiation examination (PIE) to gauge performance. The examinations will include visual inspections to monitor fuel performance. Direct physical measurements may be taken as needed.

The licensee concluded that TMI-1 can operate safely with the demonstration program in place. The advanced zirconium-based alloys have been shown through testing to perform satisfactorily under conditions representative of a reactor environment. In addition, the relatively small number of fuel rods involved does not represent a large inventory of radioactive material which could be released into the reactor coolant in the event of fuel failure. The number of fuel rods involved is very small in comparison to the total core inventory. Failure of all the advanced cladding fuel rods from a cause related to the demonstration would constitute significantly less than 1% fuel failure postulated in FSAR Chapter 14 safety analyses. Failure of the fuel as a result of some unrelated phenomenon would not result in greater inventory release than non-demonstration fuel. Therefore, the licensee concluded that safety significance of this change is minimal.

The staff considers these two demonstration assemblies as lead test assemblies (LTAs). In general, there are two criteria governing the use of LTAs: (1) the total number of demonstration assemblies in one core should be limited, and (2) the demonstration assemblies should not be loaded in limiting

positions. The licensee's demonstration program conforms to these criteria. The staff, therefore, concludes that these two demonstration assemblies are acceptable for TMI-1 Cycle 11 and future cycles.

The licensee also requested an exemption to 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K in its letter of June 1, 1995, since the two demonstration assemblies contain cladding material which is not zircaloy or ZIRLO, but has similar chemical properties. The staff considered issuance of an exemption but determined that, because the clad material to be used in these test assemblies is neither zircaloy nor ZIRLO, these regulations do not apply and, therefore, an exemption is not required.

The requested change would modify TS 5.3.1, "REACTOR CORE," to allow the use of "BWFC zirconium-based M4 or M5 alloy materials" in addition to zircaloy and ZIRLO as fuel rod clad material. Based on the above evaluation, the staff concludes that the change is acceptable.

The NRC staff has reviewed the licensee's TS change submittal for TMI-1, Cycle 11 and future cycles. Inasmuch as these two assemblies are test assemblies and the data from these assemblies will be used to achieve improved performance for future fuel rod material, the staff conclude that the licensee has provided adequate safety assurance for these two assemblies starting in TMI-1 Cycle 11. Based on the staff's evaluation of the advanced alloy requirements, the use of two demonstration assemblies and TS changes for TMI-1 Cycle 11 and future cycles are approved.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 32366). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the

public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Ronald W. Hernan

Date: July 24, 1995