METROPOLITAN EDISON COMPANY

JERSEY CENTRAL POWER AND LIGHT COMPANY

AND

PENNSYLVANIA ELECTRIC COMPANY

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

Operating License No. DPR-50
Docket No. 50-289
Technical Specification Change Request No. 225

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF DAUPHIN)

This Technical Specification Change Request is submitted in support of Licensee's request to change Appendix A to Operating License No. DPR-50 for Three Mile Island Nuclear Station, Unit 1. As part of this request, proposed replacement pages for Appendix A are also included.

GPU NUCLEAR CORPORATION

BY: [signature]
Vice President and Director, TMI-1

Sworn and subscribed before me this 7th day of June, 1993.

[signature]
Notary Public

Notarial Seal
Melody Kim Kulp, Notary Public
Londonderry Twp., Dauphin County
My Commission Expires Aug. 21, 1993

Member, Pennsylvania Association of Notaries

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF
GPU NUCLEAR CORPORATION

DOCKET NO. 50-289
LICENSE NO. DPR-50

CERTIFICATE OF SERVICE

This is to certify that a copy of Technical Specification Change Request No. 225 to Appendix A of the Operating License for Three Mile Island Nuclear Station Unit 1, has, on the date given below, been filed with executives of Londonderry Township, Dauphin County, Pennsylvania; Dauphin County, Pennsylvania; and the Pennsylvania Department of Environmental Resources, Bureau of Radiation Protection, by deposit in the United States mail, addressed as follows:

Mr. Daryl LeHew, Chairman
Board Supervisors of
Londonderry Township
R. D. #1, Geyers Church Road
Middletown, PA 17057

Mr. Russel L. Sheaffer, Chairman
Board of County Commissioners
of Dauphin County
Dauphin County Courthouse
Harrisburg, PA 17120

Director, Bureau of Radiation Protection
Attn: Mr. Richard Janati
Pa Dept. of Environmental Resources
P. O. Box 2063
Harrisburg, PA 17120

GPU NUCLEAR CORPORATION

BY: [signature]
Vice President and Director, TMI-1

DATE: June 7, 1993

ENCLOSURE

I. TECHNICAL SPECIFICATION CHANGE REQUEST (TSCR) NO. 225

GPUN requests that the following changed replacement pages be inserted into the existing Technical Specifications:

Revised pages: 3-21, 3-23, 3-24, 3-45, 5-4, and 6-19

These pages are attached to this change request.

II. REASON FOR CHANGE

Technical Specification Section 5.3.1.5 is revised to include potential use of gadolinia-urania integral burnable poison fuel pellets in the TMI-1 core.

Technical Specification Section 6.9.5.2 is revised to replace the existing list of NRC approved analytical methods used to determine core operating limits with the NRC approved Topical Report BAW-10179P. BAW-10179P consolidates in one report the methodologies currently listed in Section 6.9.5.2. BAW-10179P was approved by NRC SER, dated March 16, 1993 (letter from A. C. Thadani to J. D. McCarthy, Chairman BWOG Core Performance Committee).

Technical Specification Sections 3.3.1.1.a is revised to increase the minimum required Borated Water Storage Tank (BWST) concentration from 2270 ppm to 2500 ppm. Technical Specification 3.3 Bases are revised to clarify the description regarding the criteria for establishing the BWST boron concentration limit and the acceptable reactor building spray and sump pH range. The Bases description of the BWST water volume limit is also clarified to more accurately reflect the usable volume. The Bases reference is also revised to correctly reference the peak clad temperature limit of 2200°F in lieu of 2300°F, as required by 10 CFR 50.46.

Technical Specification Section 3.8 Bases are revised to delete the reference to a specific refueling boron concentration since this value is a cycle specific requirement based on core design.

III. SAFETY EVALUATION JUSTIFYING CHANGE

Gadolinia-urania integral burnable poison fuel pellets

TMI-1 Cycle 10 is currently designed for 646±15 EFPD. Future cycles are planned for 650 EFPD nominal lengths. The longer cycle lengths require higher enriched fuel which results in higher power peaking. TMI-1 is presently licensed to receive, store, and utilize reload fuel assemblies and rods with a maximum nominal 5.0 weight percent U235. The use of gadolinia permits improved fuel assembly power peaking control which helps to control core power peaking and ensure design criteria and requirements are met. In addition, gadolinia has the potential benefits of better fuel utilization, lower fuel cycle costs and increased fuel management flexibility.

B&W Fuel Company (BWFC) initiated a program in the mid-1970's to evaluate the use of gadolinia as a burnable absorber. This program resulted in the development and benchmark of a neutronics and fuel rod model, measurement of material properties of gadolinia fuel, successful irradiation of gadolinia lead test assemblies and hot cell destructive examinations of gadolinia bearing fuel rods. B&W has developed and benchmarked analytical tools to address the neutronics and thermal-mechanical design characteristics associated with the use of gadolinia in fuel rod design. The NRC has approved the use of the NEMO nodal code (BAW-10180, Rev. 1, letter from A. C. Thadani, NRC to J. H. Taylor, B&W, dated January 29, 1993) for use in calculating the reactivity and power distributions for gadolinia-urania fueled cores. This approval is based on B&W demonstration that the NEMO/GD methodology is applicable for use in PWR licensing applications, including performing reload physics analysis, core physics test manuals, safety analyses, and startup predictions. NRC is currently reviewing the GDTACO Topical Report, BAW-10184P, for predicting urania-gadolinia fuel rod behavior. The use of gadolinia-urania fuel in TMI-1 Cycle 10 is dependent upon NRC approval of GDTACO. The feasibility and operability of gadolinia-bearing fuel rods in the BWFC Mark B 15x15 fuel assembly has been demonstrated in BAW-1681-11, "Qualification of the B&W Mark B Fuel Assembly for High Burnup and Development of an Advanced Extended Burnup Fuel Assembly Design Incorporating Urania-Gadolinia," February 1991.

Based on the above discussion, implementation of this change is administrative and will have no affect on nuclear safety or safe plant operations.

Reference of Topical Report BAW-10179P

Topical Report BAW-10179P describes the methodologies and safety criteria that are applied to the fuel (mechanical), nuclear, thermal-hydraulic, and safety analyses for the reload fuel supplied by BWFC for B&W designed 177 fuel assembly plants.

The NRC staff has reviewed the Topical Report BAW-10179P and found it acceptable for referencing in license applications (NRC letter from A. C. Thadani to J. D. McCarthy, BWOG, dated March 16, 1993). Specifically, the NRC stated "Core Operating Limits Report (COLR) limits may be established and modified using the approved methodologies identified above. Licensees of B&W designed plants may reference this report (BAW-10179P) in the Reporting Requirements Section of their Technical Specifications in place of the references stated above." The references stated above are a list of 18 references which include all of the twelve references currently contained in TMI-1 Technical Specification Section 6.9.5.2 and also includes references to NEMO which will be used in the Cycle 10 Reload Design and for future cycles designed by BWFC. Thus BAW-10179P is an all encompassing report, establishing the BWFC methodology for cycle reloads. The NRC SER further states, "Subsequently, if an NRC-approved methodology change to any of these reports is used in the calculation of COLR parameters, BAW-10179P will have to be updated to incorporate this change. The approved revision number at the time the reload analyses are performed, and the COLR parameters are determined, will be identified in the COLR."

Based on the above discussion, implementation of this change is administrative and will have no affect on nuclear safety or safe plant operations.

Revised Boron Concentration Requirements

The longer cycle lengths and higher enriched, higher reactivity core design for TMI-1 Cycle 10 (and future cycles) require higher boron concentrations in the BWST to satisfy the existing requirements to maintain the reactor at least one percent subcritical following a loss-of-coolant accident. The BWST functions as part of the emergency core cooling system (ECCS) by providing a source of borated water for high pressure injection by the makeup and purification system (HPI), low pressure injection of borated water by the decay heat removal system (LPI), for emergency cooling of the reactor building by the building spray system, scrubbing of fission products from the reactor building atmosphere by the building spray system, and by providing a source of water to permit long term core cooling by recirculation from the reactor building sump to the core through the decay heat removal system. The minimum BWST boron concentration currently specified in Technical Specification Section 3.3.1.1.a is 2270 ppm boron. Cycle 10 core design calculations have determined that the minimum concentration must be raised to at least 2462 ppm boron.

A new minimum value of 2500 ppm boron is proposed to provide additional conservatism and to provide flexibility for future cycles. This value is well below the precipitation limit of 5250 ppm at 40°F. Therefore, the existing minimum BWST Technical Specification temperature limit of 40°F is not affected. The proposed change will ensure that during normal operation, the BWST boron concentration will be sufficient to produce a boron concentration in the reactor building sump that will maintain the reactor at least one percent subcritical following a postulated loss-of-coolant accident. The revised BWST boron concentration requirement was established by conservatively assuming the Core Flood Tank boron concentration to be at the minimum value of 2270 ppm currently specified in Technical Specification Section 3.3.1.2. This Core Flood Tank concentration was demonstrated to be adequate for post-LOCA requirements.

The existing requirements of Technical Specification Section 3.2 for the boric acid mix tank and the reclaimed boric acid storage tank volume and concentration limits continue to provide adequate boration under all operating conditions to assure the ability to bring the reactor to a cold shutdown condition. Therefore, these limits are not affected by the Cycle 10 core design.

Increased boron concentration in the BWST has been analyzed to determine potential affects on the pH values for reactor building spray and reactor building sump inventory following a design basis accident. Bounding flow rate calculations for large break and small break LOCAs were performed to determine the volumes of BWST and sodium hydroxide (NaOH) injected. The NaOH tank level was assumed to be at the existing Technical Specification required level. The change in BWST specific gravity resulting from the increased boron concentration is insignificant and has no effect on this setpoint.

Single failures which would result in the maximum and minimum pH conditions were analyzed. Each flow mode was analyzed with the following two (2) conditions:

1. Maximum sodium hydroxide and minimum borated water initial conditions.

2. Minimum sodium hydroxide and maximum borated water initial conditions.

These values were then used to calculate the reactor building spray and sump pH. Maximum or minimum core flood tank and reactor coolant boron and lithium concentrations were assumed in the most conservative combination. The results of these analyses show that the reactor building spray and final equilibrium sump pH are within an acceptable range of 8.0 to 11.0. The potential affect of reducing the reactor building spray and sump minimum acceptable pH from 8.5 to 8.0 was evaluated for impact on materials compatibility, equipment qualification, and offsite dose consequences.

Maintaining the reactor building spray and core cooling water pH above 7.0 is adequate to inhibit initiation of stress corrosion cracking of austenitic stainless steel within the reactor coolant pressure boundary. This is consistent with NRC Standard Review Plan 6.1.1. The corrosive nature of the reactor building spray and sump fluid is essentially unchanged due to the pH reduction from 8.5 to 8.0. A review of material properties of exposed equipment and present qualification conditions has confirmed that this change results in no mechanism that would result in an increased likelihood of component failure. Therefore, the proposed change in minimum pH from 8.5 to 8.0 has no effect on material and fluids compatibility or equipment qualification criteria.

The proposed change in pH from 8.5 to 8.0 was evaluated for potential impact on previously analyzed dose consequences of the postulated design basis Maximum Hypothetical Accident (MHA). The methodology employed in the TMI-1 FSAR for assessing these dose consequences followed the ANSI/ANS 56.5-1979 Standard for "PWR and BWR Containment Spray System Design Criteria." This criteria varies the spray partition coefficient based on the pH of the spray, resulting in a lower elemental iodine removal rate with lower pH. However, additional research and testing on iodine chemistry since 1979 has determined that partition coefficients for containment spray solutions and the resulting iodine removal rates are not affected by the chemistry of the solution during the initial spray period and that a reactor building sump solution pH of 7.0 is sufficient to prevent revolatilization of iodine to the containment atmosphere (Reference NUREG/CR-4081, July 1985; NUREG/CR-4697, October 1986; NUREG/CR-2900, October 1992; and NUREG/CR-2493, April 1982). Although, this additional research and testing data has determined that reactor building spray chemistry has no affect on iodine removal efficiencies, TMI-1 has reanalyzed the design basis MHA with a reduced partition coefficient based on ANSI/ANS 56.5-1979, and using the Technical Specification reactor building leak rate limit of 0.10% per day

in lieu of the previously assumed value of 0.12% per day. The results of this analysis has determined that the dose consequences are bounded by the existing MHA analysis, and are well below the guidelines of 10 CFR 100.

The increased BWST boron concentration has been evaluated for the potential for boron precipitation in the core during the long term cooling period following a LOCA. For a cold leg large break LOCA, the core dissipates heat by pool nucleate boiling. Because of this boiling phenomenon in the core, the boric acid concentration will increase in this region. If allowed to proceed in this manner, a point may be reached where boron precipitation could occur in the core. The prevention of boron precipitation is one of the requirements of long-term cooling. Post-LOCA emergency procedures direct the operator to establish dilution flow paths in the LPI System to prevent this condition by establishing a forced flow path through the core regardless of break location. It has been determined that a BWST boron concentration of up to 2800 ppm continues to assure that the boron concentration in the core would remain well below the solubility limit based on operator action in accordance with the plant procedures.

The proposed change to the Technical Specification Section 3.3 Bases clarifies that this Technical Specification pertains to the operability of the BWST as part of the emergency core cooling system (ECCS) in the event of a LOCA. During normal operation the BWST minimum concentration requirement assures that the reactor will remain at least one percent subcritical following a loss-of-coolant accident. This analysis is performed each cycle at 70°F and 300°F reactor building sump temperatures to determine the controlling condition for BWST boron concentration requirements. For Cycle 10, 300°F sump temperature is more limiting, therefore, the reference to 70°F is incorrect. The existing basis also incorrectly references the acceptance criteria for a fuel handling accident inside the reactor building (FSAR 14.2.2.1). The basis for acceptable refueling boron concentration requirements to satisfy fuel handling accident acceptance criteria are described in Technical Specification Section 3.8 Bases. Therefore, this is an administrative change to the bases.

Technical Specification Section 3.3 Bases are also revised to clarify that the existing BWST minimum water volume limit considers water not usable because of tank discharge location and reactor building sump recirculation switchover setpoint. This change does not affect the existing Technical Specification requirements and provides a more accurate basis description. Therefore, this is an administrative change. The Bases revision to identify the peak clad temperature limit as 2200°F, in accordance with 10 CFR 50.46, is also an editorial correction.

Technical Specification Section 3.8 Bases are revised to remove the description that refueling boron concentration is to be maintained above 1800 ppm. This value is a cycle specific requirement based on core design. The existing basis statement that the boron concentration will be maintained sufficient to maintain core $k_{eff} \leq 0.99$ if all the control rods were removed from the core, adequately describes the criteria for establishing the specific value of refueling boron concentration from cycle to cycle. Therefore, this is an administrative change.

IV. NO SIGNIFICANT HAZARDS CONSIDERATIONS

GPU Nuclear has determined that this Technical Specification Change Request poses no significant hazards as defined by NRC in 10 CFR 50.92.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability of occurrence or the consequences of an accident previously evaluated. The use of gadolinia-urania fuel rods has been adequately demonstrated and bench-marked by B&W. Reactivity and power distribution limits for a gadolinia-urania fueled core will be based on approved BAW-10180, Rev. 1, NEMO methodology. NRC approval of GDTACO BAW-10184P will provide an approved methodology for predicting gadolinia-urania fuel rod behavior. All previous safety and design criteria will be met.

   The proposed change to reference Topical Report BAW-10179P as the description of the methodologies and safety criteria applicable to fuel mechanical, nuclear, thermal-hydraulic, and reload safety analyses, is considered administrative since this Topical Report has been reviewed and approved by NRC.

   The proposed changes to the BWST boron concentration requirement and Bases change to the minimum acceptable pH value have been evaluated and determined to have no affect on the consequences of an accident previously evaluated and continue to provide sufficient margin to the solubility limit in the core during long-term cooling. Additionally, the remaining proposed Bases revisions are editorial clarifications or corrections to the Bases description and do not revise the existing methods or criteria used to establish these limits.

   Therefore, the proposed changes do not involve a significant increase in the probability of occurrence or the consequences of an accident previously evaluated.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any previously evaluated. The use of gadolinia-urania fuel rods has been adequately demonstrated and bench-marked by B&W. An approved methodology will be used to predict gadolinia-urania fuel rod behavior.

   The proposed change to reference approved Topical Report BAW-10179P will continue to ensure that approved methods and criteria are used to establish core operating limits.

   The proposed changes to the BWST boron concentration and Bases change to the minimum acceptable pH value have no affect on the safety function of interfacing systems and components. Additionally, the remaining proposed Bases revisions are editorial clarifications or corrections and have no impact on the existing methods or criteria for establishing these limits.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. Existing margins of safety related to fuel rod performance are maintained with the use of gadolinia-urania fuel rods, and existing approved methods and criteria for establishing core operating limits bound the predicted gadolinia-urania fuel rod behavior.

   The proposed change to reference approved Topical Report BAW-10179P maintains existing margins of safety since previously approved methods and criteria are still used to establish core operating limits.

   The proposed change to the BWST boron concentration results in a minimal change to the previously accepted lower pH value of the reactor building spray and sump inventory. This change has no affect on materials compatibility, criteria for environmental qualification of equipment, or the potential for boron precipitation. Additionally, the remaining proposed Bases revisions are editorial clarifications or corrections and have no potential to impact margins of safety.

   Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

V. IMPLEMENTATION

GPUN requests that the amendment authorizing these changes be issued by September 1, 1993 to support TMI-1 Cycle 10 startup planned for approximately October 15, 1993.