



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO REQUEST FOR EXEMPTION FROM 10 CFR 70.24

GPU NUCLEAR CORPORATION

THREE MILE ISLAND UNIT 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By submittal dated February 7, 1997, as supplemented March 26 and June 5, 1997, GPU Nuclear Corporation (the licensee) requested an Exemption from the requirements of subsection (a) of 10 CFR 70.24 "(Criticality Accident Requirements.)" The staff evaluation of this above cited request is delineated below.

2.0 EVALUATION

The Code of Federal Regulations at subsection (a) of 10 CFR 70.24, "Criticality Accident Requirements," requires that each licensee authorized to possess special nuclear material shall maintain in each area where such material is handled, used, or stored, a criticality monitoring system "using gamma- or neutron-sensitive radiation detectors which will energize clearly audible alarm signals if accidental criticality occurs." Subsection (a)(2) of 10 CFR 70.24 specifies the detection, sensitivity, and coverage capabilities of the monitors required by 10 CFR 70.24(a) for persons licensed prior to December 6, 1974. The specific requirements of Subsection (a)(2) are to "maintain a monitoring system capable of detecting a criticality which generates radiation levels of 300 rems per hour one foot from the source of the radiation." Subsection (a)(3) of 10 CFR 70.24 requires that the licensee shall maintain emergency procedures for each area in which this licensed special nuclear material is handled, used, or stored and provides (1) that the procedures ensure that all personnel withdraw to an area of safety upon the sounding of a criticality monitor alarm, (2) that the procedures must include drills to familiarize personnel with the evacuation plan, and (3) that the procedures designate responsible individuals for determining the cause of the alarm and placement of radiation survey instruments in accessible locations for use in such an emergency. Subsection (d) of 10 CFR 70.24 states that any licensee who believes that there is good cause why he should be granted an

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exemption from all or part of 10 CFR 70.24 may apply to the Commission for such an exemption and shall specify the reasons for the exemption requested.

The purpose of 10 CFR 70.24(a), (a)(2), and (a)(3) is to ensure that any inadvertent criticality is detected and that action is taken to protect personnel and correct the problem. By letter dated February 7, 1997, as supplemented March 26, 1997, and June 5, 1997, the licensee requested an exemption from the requirements of 10 CFR 70.24(a). The licensee proposes to handle and store unirradiated fuel and other special nuclear material without having either the criticality monitoring system or the emergency procedures specified in 10 CFR 70.24. The licensee believes that procedures and design features make an inadvertent criticality unlikely, in accordance with General Design Criterion 62.

Special nuclear material, as nuclear fuel, is stored in the spent fuel pool or the new (unirradiated) fuel storage racks. The spent fuel pool is used to store irradiated fuel under water after its discharge from the reactor, and new fuel prior to loading into the reactor. The new fuel racks are used to store new fuel in a dry condition upon arrival on site.

Special nuclear material is also present in the form of fissile material incorporated into nuclear instrumentation. The small quantity of special nuclear material present in these items precludes an inadvertent criticality.

Consistent with Technical Specifications (TS) Section 5.4.1, the spent fuel pool is designed to store the fuel in a geometric array that precludes criticality. The spent fuel racks are designed such that the effective neutron multiplication factor,  $k_{eff}$ , will remain less than or equal to 0.95 under all normal and accident conditions for fuel of maximum enrichment of 5.0 wt% U-235. The staff has found this design adequate.

The new fuel storage racks may be used to receive and store new fuel in a dry condition upon arrival on site and prior to loading in the reactor or spent fuel pool. The spacing between new fuel assemblies in the storage racks is sufficient to maintain the array in a subcritical condition even under accident conditions assuming the presence of moderator. The maximum enrichment of 5.0 wt% U-235 for the new fuel assemblies results in a maximum  $k_{eff}$  of less than 0.95 under conditions of accidental flooding by unborated water, and  $k_{eff}$  less than 0.98 under conditions of low-density optimum moderation. The staff has found the design of the licensee's new fuel storage racks to be adequate to store fuel enriched to no greater than 5.0 wt% U-235. Nuclear fuel is moved between the new fuel storage racks, the reactor vessel, and the spent fuel pool to accommodate refueling operations. In addition, fuel is moved into the facility and within the reactor vessel, or within the spent fuel pool. In all cases, fuel movements are procedurally controlled and designed to preclude conditions involving criticality concerns. Fuel handling procedures and the design features of the fuel handling system are discussed in the licensee's Final Safety Analysis Report.

Procedures and controls prevent an inadvertent criticality during fuel handling; nevertheless, radiation monitoring, as required by General Design Criterion 63, is provided for handling new fuel prior to being placed into the

spent fuel pool. In addition, handling of fuel in the spent fuel pool is monitored by TS-required radiation monitors on the fuel handling bridges. These required radiation monitors have alarm response procedures which provide instructions to the operators upon receipt of alarms.

The licensee conducts training of fuel handling bridge operators and maintenance personnel. In addition, all individuals who have access to radiologically controlled areas are required to complete initial training, and annual refresher training thereafter, which includes proper response to area radiation monitor alarms.

The purpose of 10 CFR 70.24 is to ensure that if a criticality were to occur during the handling of special nuclear material, personnel would be alerted to that fact and would take appropriate action. The staff has determined that such an accident is highly unlikely to occur; furthermore, the licensee has radiation monitors, as required by General Design Criterion 63, in fuel storage and handling areas. These monitors will alert personnel to excessive radiation levels and allow them to initiate appropriate safety actions. The low likelihood of an inadvertent criticality together with the licensee's adherence to General Design Criterion 63 and radiation worker training constitute good cause for granting an exemption to the requirements of 10 CFR 70.24(a).

### 3.0 CONCLUSION

Based upon the information provided, there is reasonable assurance that irradiated and unirradiated fuel will remain subcritical during handling and storage. The circumstances for granting an exemption to 10 CFR 70.24(a) are met because criticality is precluded with the present design configuration, TS requirements, administrative controls, and the fuel handling equipment and procedures. Therefore, the staff concludes that the licensee's request for an exemption from the requirements of 10 CFR 70.24(a) is acceptable and should be granted.

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Dated: July 3, 1997