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November 15, 1985
NRC/TMI 85-090

Docket No. 50-320

Mr. F. R. Standerfer
Vice President/Director
Three Mile Island Unit 2
GPU Nuclear Corporation
P. O. Box 480
Middletown, PA 17057

Dear Mr. Standerfer:

Subject: Heavy Load Handling Inside Containment, Revision 2

The Nuclear Regulatory Commission (NRC) has reviewed your September 11, 1985, Safety Evaluation Report (SER) for Heavy Load Handling Inside Containment, Revision 2. As stated in the enclosed safety evaluation issued by the staff, we conclude that heavy loads can be handled over fuel bearing canisters inside the reactor building and spent fuel pool without a significant risk to the health and safety of the public, provided they are in accordance with the limitations stated in the TMI-2 Proposed Technical Specifications, your subject SER, and our responding SER. This activity falls within the scope of activities previously considered in the Programmatic Environmental Impact Statement.

Sincerely,
ORIGINAL SIGNED BY:
William D. Travers

William D. Travers
Acting Director
TMI Program Office

Enclosure: As stated

cc: T. F. Demmitt
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOR

HEAVY LOAD HANDLING INSIDE THE TMI-2 CONTAINMENT

AND FUEL HANDLING BUILDING

A. INTRODUCTION

On November 1, 1984, GPU Nuclear Corporation (GPUNC) submitted to the staff for approval, a safety evaluation for handling heavy loads inside the reactor building in accordance with the requirements of NUREG-0612. This was reviewed and subsequently approved by the NRC in letters dated December 18, 1984 and March 14, 1984. This safety evaluation did not address the handling of heavy loads over the reactor vessel, incore instrument seal table and guide tubes nor the northwest corner of the A "D ring". On April 19, 1985, GPUNC submitted a safety evaluation Report (SER) which addressed heavy loads over the reactor vessel. This SER was reviewed by the NRC staff and approved on May 2, 1985. Certain loads and pathways which would exist during defueling were not addressed by the above safety evaluations. After defueling plans were more accurately defined and the pathways and loads more clearly identified, GPUNC submitted the Safety Evaluation Report for Heavy Load Handling Inside Containment, Revision 2, on September 11, 1985. This submittal fulfilled the requirements of Generic Letter 81-07 (Phase I) and proposed technical specifications (PTS) 3.10.1 and 3.10.2 for the areas which it addresses. Additional information was requested by the staff on October 18, 1985 (letter NRC/TMI-078) and responses received from the licensee on October 31, 1985 and November 5, 1985 (references 6 and 7).

B. DISCUSSION

The Safety Evaluation Report for Heavy Load Handling Inside Containment, Revision 2 expands on the previous revision to include the use of canister handling bridges, lifting of canisters containing fuel bearing material and lifting of heavy loads over those canisters. This includes lifting canisters over canisters. The scope includes transfer within the reactor building, transfer to the fuel handling building, and canister handling inside the fuel handling building but does not include transfers to shipping casks. An additional safety evaluation report will be required for that activity.

C. REGULATORY REQUIREMENTS

Generic letters 81-07 and 85-11 require that GPUNC complete phase I (i.e., section 5.1.1) of NUREG 0612. Phase one included the following activities:

1. Definition of safe load paths

2. Development of load handling procedures

3. Periodic inspection and testing of cranes

4. Qualifications, training and specified conduct of operators

5. Special lifting devices should satisfy the guidelines of ANSI N14.66

6. Lifting devices that are not specially designed should be installed and used in accordance with the guidelines of ANSI B30.9

7. Design of cranes to ANSI B30.2 or CMAA-70

These areas have been previously reviewed and approved (references 1, 2, and 3). The canister handling bridges including the shield collars, have been designed to conform to ANSI B30.2, ANSI B30.16 and to ANSI N14.6 section 3.2.1 for static and dynamic loads. The staff finds this acceptable. The above activities assure that the potential for a load drop is very small.

GPUNC used the four criteria in section 5.1(2) of NUREG 0612 to evaluate the potential consequences of a dropped load involving fuel canisters. These four criteria are:

I. Releases of radioactive material that may result from damage to spent fuel based on calculations involving accidental dropping of a postulated heavy load produce dose that are well within 10 CFR Part 100 limits of 300 rem thyroid, 25 rem whole body (analyses should show that doses are equal to or less than 1/4 of Part 100 limits);

II. Damage to fuel and fuel storage racks based on calculations involving accidental dropping of a postulated heavy load does not result in a configuration of the fuel such that k_{eff} is larger than

III. Damage to the reactor vessel or the spent fuel pool based on calculations of damage following accidental dropping of a postulated heavy load is limited so as not to result in water leakage that could uncover the fuel (makeup water provided to overcome leakage should be from a borated source of adequate concentration if the water being lost is borated); and

IV. Damage to equipment in redundant or dual safe shutdown paths, based on calculations assuming the accidental dropping of a postulated heavy load, will be limited so as not to result in loss of required safe shutdown functions.

The staff agrees that meeting the intent of the above criteria in conjunction with the Phase I program provides an acceptable basis for approving the safety evaluation required by PTS 3.10.1 and 3.10.2.

D. LOAD DROP ACCIDENTS AND CONSEQUENCES

Several accident scenarios were considered by GPUNC and evaluated by the NRC staff. The NUREG 0612 5.1(2) criteria are presented with the scenario which tests the safety margin.

I. Dose Consequences of Release.

The licensee assumed that a canister drop released the entire unaccounted for Kr-85 inventory (~ 31,000 curies) of the core along with 0.12 w/o of the contents of a canister as particulate matter. The resultant offsite dose consequences were less than 4% of the acceptance criteria. The licensee's analysis presented a very conservative case from both a probabalistic and consequence standpoint. The drop was assumed to occur over a dry location; the canisters will be retained by two separate, diverse mechanisms when lifted over dry areas. The drop assumed a dry powder was in the canisters when they will in actuality be drained but wet with surface water.

II. Maintenance of criticality Safety Margin.

The licensee and the staff both considered cases where a canister was dropped on another canister either in the fuel transfer canal or spent fuel pool. The entire contents of the upper canister were assumed to spill and assume worst case geometry including highest enrichment fuels surrounding the lower canister. No credit was taken for zirconium cladding material, nor the poison (criticality control) materials incorporated in the canister nor the structural materials of the canister. Analyses by the NRC (reference 5) concluded that a considerable shutdown margin (K_{eff} less than 0.95) would exist. GPUNC also examined the case of an infinite array in a drained fuel pool condition and concluded that subcriticality would be maintained (k_{eff} less than 0.964). The infinite array scenario would require a series of dozens of consecutive dropped canisters; and it was not considered credible by the NRC staff.

III. Leakage from Reactor Vessel and Spent Fuel Pool Within Acceptable Limits or Consequences

The NRC staff review and approval of GPUNC's load drop and leakage analysis for the reactor vessel is found in reference 3. If the spent fuel pool or fuel transfer canal were to drain there would be no immediate effects. The entire core has a decay heat of less than 12 Kw; heat generation in individual stored canisters will be less than 100 watts and pose no problem. Potential for gas generation in the canisters has been previously evaluated and found acceptable in reference 4. Thus the canisters will remain stable for long periods of time in a drained pool. This will allow GPUNC to effect repairs as a long term project.

IV. Damage to Safe Shutdown Equipment

The activities addressed will not result in loads over essential safe shutdown equipment. In the current mode forced cooling of the core is not required. A dropped load could potentially cause leakage thru the incore instrument tubes. The consequences of this accident and GPUNC's

ability and method to mitigate it were evaluated and found acceptable in reference 3.

CONCLUSIONS

Implementation of Generic Letter 81-07 Phase I safeguards provides sufficient protection that the risk associated with the expanded scope of heavy load handling is acceptably small. Consequences of potential accidents involving the expanded scope of activities have also been evaluated and found to be acceptably small. GPUNC's program for Heavy Load Handling Inside Containment, Revision 2 can be implemented without significant risk to the health and safety of the public.

REFERENCES

1. NRC letter B. J. Snyder to F. R. Standerfer "Heavy Load Travel Inside Containment" dated December 18, 1984

2. NRC letter B. J. Snyder to F. R. Standerfer "Heavy Load Travel Inside Containment" dated March 14, 1985

3. NRC letter B. J. Snyder to F. R. Standerfer "Heavy Load Handling Over the TMI-2 Reactor Vessel", dated May 2, 1985

4. NRC letter W. D. Travers to F. R. Standerfer "Defueling Canister Technical Evaluation Report" dated November 5, 1985

5. NRC memorandum C. R. Carotta to R. A. Weller "Criticality Safety Evaluation of a Loaded Canister Droppings Its Contents Onto a Similar Loaded Canister in a Maximum Volume Storage Unit" dated October 30, 1985

6. GPU letter 4410-85-L-0211, F. R. Standerfer to W. D. Travers "Safety Evaluation Report of Heavy Load Handling Inside Containment, Revision 2" dated October 31, 1985

7. GPU Letter 4410-85-L-0222, F. R. Standerfer to W. D. Travers "Heavy Load Handling Safety Evaluation Report" dated November 5, 1985

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