Distribution:
Docket No. 50-320
NRC PDR
Local PDR
DCS
TMI HQ R/F
TMI Site R/F
BJSnyder
WDTravers
TCPoindexter
MTMasnik
RAWeller
PJGrant
RCook
CCowgill
LChandler, ELD
IE (2)
TBarnhart (4)
OPA
ACRS (16)
HRDenton/Eisenhut
M-town Office

May 2, 1985

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: Three Mile Island Nuclear Station Unit 2
Operating License DPR-73
Docket No. 50-320
Heavy Load Handling Over the TMI-2 Reactor Vessel

The Nuclear Regulatory Commission (NRC) has reviewed your April 19, 1985, Safety Evaluation Report for Heavy Load Handling Over the TMI-2 Reactor Vessel. As stated in the enclosed safety evaluation issued by the staff, we conclude that in accordance with the limitations stated in the TMI-2 Proposed Techaical Specifications, your subject SER and our responding SER, heavy loads can be handled over the reactor vessel without a significant risk to the health and safety of the public.

Sincerely,

Original signed by
B. J. Snyder

Bernard J. Snyder, Program Director
Three Mile Island Program Office
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: T. F. Demmitt
R. E. Rogan
S. Levin
W. H. Linton
J. J. Byrne
A. W. Miller
Service Distribution List
(See attached)

8505090116 850502
PDR ADOCK 05000320
P PDR

| | | | | |
|---|---|---|---|---|
| OFFICE | TMIPO:NRR | SL:TMIPO:NRR | PD:TMIPO:NRR | |
| SURNAME | TCPoindexter:bg | RAWeller | BJSnyder | |
| DATE | 5/2/85 | 5/2/85 | 5/ /85 | |

# TMI-2 SERVICE LIST

Dr. Thomas Murley
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

John F. Wolfe, Esq., Chairman,
Administrative Judge
3409 Shepherd St.
Chevy Chase, MD 20015

Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Frederick H. Shon
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Karin W. Carter
Assistant Attorney General
505 Executive House
P.O. Box 2357
Harrisburg, PA 17120

Dr. Judith H. Johnsrud
Environmental Coalition on
Nuclear Power
433 Orlando Ave.
State College, PA 16801

George F. Trowbridge, Esq.
Shaw, Pittman, Potts and
Trowbridge
1800 M. St., NW.
Washington, D.C. 20036

Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Atomic Safety and Licensing Appeal Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Secretary
U.S. Nuclear Regulatory Commission
ATTN: Chief, Docketing & Service Branch
Washington, D.C. 20555

Mr. Larry Hochendoner
Dauphin County Commissioner
P.O. Box 1295
Harrisburg, PA 17108-1295

John E. Minnich, Chairperson,
Dauphin County Board of Commissioners
Dauphin County Courthouse
Front and Market Streets
Harrisburg, PA 17101

Dauphin County Office of Emergency
Preparedness
Court House, Room 7
Front & Market Streets
Harrisburg, PA 17101

U.S. Environmental Protection Agency
Region III Office
ATTN: EIS Coordinator
Curtis Building (Sixth Floor)
6th & Walnut Streets
Philadelphia, PA 19106

Thomas M. Gerusky, Director
Bureau of Radiation Protection
Department of Environmental Resources
P.O. Box 2063
Harrisburg, PA 17120

Dan Kennedy
Office of Environmental Planning
Department of Environmental Resources
P.O. Box 2063
Harrisburg, PA 17120

Willis Bixby, Site Manager
U.S. Department of Energy
P.O. Box 88
Middletown, PA 17057-0311

David J. McGoff
Division of Three Mile Island Programs
NE-23
U.S. Department of Energy
Washington, D.C. 20545

William Lochstet
104 Davey Laboratory
Pennsylvania State University
University Park, PA 16802

Randy Myers, Editorial
The Patriot
812 Market St.
Harrisburg, PA 17105

Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 220
7910 Woodmont Ave.
Bethesda, MD 20814

Michael Churchhill, Esq.
PILCOP
1315 Walnut St., Suite 1632
Philadelphia, PA 19107

Linda W. Little
5000 Hermitage DR.
Raleigh, NC 27612

Marvin I. Lewis
6504 Bradford Terrace
Philadelphia, PA 19149

Jane Lee
183 Valley Rd.
Etters, PA 17319

J.B. Liberman, Esquire
Berlack, Israels, Liberman
26 Broadway
New York, NY 10004

Walter W. Cohen, Consumer Advocate
Department of Justice
Strawberry Square, 14th Floor
Harrisburg, PA 17127

Edward O. Swartz
Board of Supervisors
Londonderry Township
RFD #1 Geyers Church Rd.
Middletown, PA 17057

Robert L. Knupp, Esquire
Assistant Solicitor
Knupp and Andrews
P.O. Box P
407 N. Front St.
Harrisburg, PA 17108

John L[illegible], Esquire
Pennsylvania Public Utilities Comm.
P.O. Box 3265
Harrisburg, PA 17120

Honorable Mark Cohen
512 E-E Main Capital Building
Harrisburg, PA 17120

Mr. Edwin Kintner
Executive Vice President
General Public Utilities Nuclear Corp.
100 Interpace Parkway
Parsippany, NJ 07054

Ad Crable
Lancaster New Era
8 West King Street
Lancaster, PA 17602

Enclosure

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOR

HEAVY LOAD HANDLING OVER THE TMI-2 REACTOR VESSEL

## A. INTRODUCTION

On November 1, 1984, GPU Nuclear Corporation (GPUNC) submitted to the staff for approval, a safety evaluation for handling heavy loads inside of the reactor building in accordance with the requirements of NUREG-0612. This safety evaluation expanded the analyzed load path area previously approved by the staff. However, the expanded area 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." The Three Mile Island, Unit 2 (TMI-2) Proposed Technical Specifications (PTS) as modified by our April 23, 1985 Amendment of Order, Section 3.10 states that, "Loads in excess of 2400 lbs. [heavy load] shall be prohibited from travel over the following areas unless a docketed Safety Evaluation for the activity is approved by the NRC. a. reactor vessel...." Based on the requirements and limitations of NUREG-0612 and the PTS, it was necessary for GPUNC to submit a safety evaluation report (SER) to address heavy load handling over the reactor vessel for plenum lift and other upcoming "over the vessel" defueling activities. Therefore on April 19, 1985, the licensee submitted the required SER.

## B. DISCUSSION

Future recovery activities require that miscellaneous loads be transported and/or placed over the open reactor vessel. The heaviest load to be moved over the vessel through the completion of defueling is the plenum assembly.

This structure in addition to the rigging that will be used to move it will weigh approximately 73 tons. Other anticipated loads include defueling equipment support structures, shielding, miscellaneous defueling equipment, defueling canisters and fuel debris. For some of these loads, the licensee has anticipated the need to move some items over the open reactor vessel enroute to their final location. However, as a prerequisite for the preparation of procedures, the licensee must analyze other load path alternates and conclude that the over-the-vessel route with all other things considered, is the best pathway for transporting the load.

C. OTHER REGULATORY REQUIREMENTS

The licensee has stated that all special load handling devices as described in the "TMI-2 Lifting and Handling Program," will be designed, constructed and tested in accordance with ANSI N14.6 - 1978. In addition, as stated in NUREG-0612, Section 5.2.2(4), the stress factors stated in Section 3.2.1 of ANSI N14.6, will be based on the combined maximum static and dynamic loads that could be impacted on the handling device. Crane operability requirements of B30.2 and B30.16 in addition to sling requirements of B30.9 and the hook requirements of B30.10 will be met as appropriate.

To provide assurance that the criteria of Section 5.1 of NUREG-0612 are met for load handling operations over the reactor vessel, the licensee has chosen to use option 5.1.3(3) as their criteria. This option requires that the effects of drops of heavy loads be analyzed and shown to satisfy at a minimum, the four evaluation criteria of Section 5.1. The four guidelines are as follows:

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 doses 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 0.95;

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 licensee has also noted that the likelihood of a drop has been minimized due to the capacity of the crane (170 tons), procedural controls for load handling activities and conservative rigging designs.

## D. LOAD DROP ACCIDENTS/CONSEQUENCES

The worst case potential accident resulting from a load drop onto the reactor vessel would be the breech of the incore instrument tubes which penetrate the bottom of the vessel. These tubes were previously addressed in the licensee's SER for the Removal of the Reactor Vessel Head dated March 9, 1984, which was approved by the staff on July 17, 1984. However, when considering the recently viewed lower core damage, there is a higher probability that some damage did occur to the incore instrumentation tube area. Therefore, the licensee has postulated all 52 tubes breaking, resulting in a 0.010 inch circular annular gap for each tube.

This leakage pathway is based on the licensee's conclusion that none of the failure mechanisms will cause the 3/4" inconnel tube to fall out of the vessel (see Figure 1). The staff, after several discussions with the licensee and our independent review, concurs with this conclusion.

Therefore, with 52 incore tubes leaking, the leak rate per tube is approximately 0.40 gpm. This equates to a total leak rate of approximately 20 gpm (52 tubes x 0.40 gpm/tube). Systems available to prevent the uncovering of the core include; (1) the Decay Heat Removal System (DHRS) in recirculation mode, (2) a greater than 20 gpm portable recirculation system that will be available for plenum lift to mix borated water in the RB sump and transfer water from the reactor building sump back to the reactor vessel, and (3) gravity flow from the BWST to the reactor vessel (temporary solution only).

The DHRS has a rated flow capacity of 3,000 gpm and is therefore more than adequate to take suction from the reactor building (RB) sump (the drainage point for [illegible] leaking RCS) and return the water back to the vessel. The portab[illegible]ation system has a minimum recirculation capacity of 20 gpm and [illegible] put in operation within 24 hours. This system would also take suction from the RB sump for recirculation and mixing and discharge back into the vessel. The BWST gravity feed has a guaranteed available inventory of 220,000 gallons of the 310,000 gallon Borated Water Storage Tank maximum estimated inventory. GPU's analyses show that a substantially greater flow rate is available by gravity flow than the 20 gpm needed.

Assuming 20 gpm is required, a recirculation capability will not be needed for approximately 183 hours or 7.6 days. This is sufficient time for deciding which recirculation system will be utilized.

It should also be noted that with no actions being taken and assuming a RCS level always above 321'-6" (just below the RV flange), an incore leak of 20 gpm will take in excess of 14 hours before water will drop to the 314' elevation (core top), thereby providing ample time to detect the leak and take action. The capability to sample the RB sump before initiating recirculation will also be available for plenum lift, thereby giving assurance that water with boron concentrations below 4350 ppm will not be pumped into the core. This boron concentration and the resulting $K_{eff}$ was addressed in the staff's Amendment of Order dated April 23, 1985.

A bounding analysis was performed by the licensee which assumes an instantaneous total release of the presently unaccounted for 31,300 curies of Kr-85 which is assumed to be trapped in the grain boundaries of fuel pellets and fuel rods. The resulting dose is 9.7 millirem to the whole body for an individual located at the nearest site boundary and 1.8 millirem to the whole body for an individual located at the Low Population Zone Boundary. Should it be necessary to go to a sump recirculation mode, any airborne particulate activity would be collected on the HEPA filters in the ventilation systems for the RB. The above doses are compared to the 6.25 rem limit of 10 CFR Part 100.

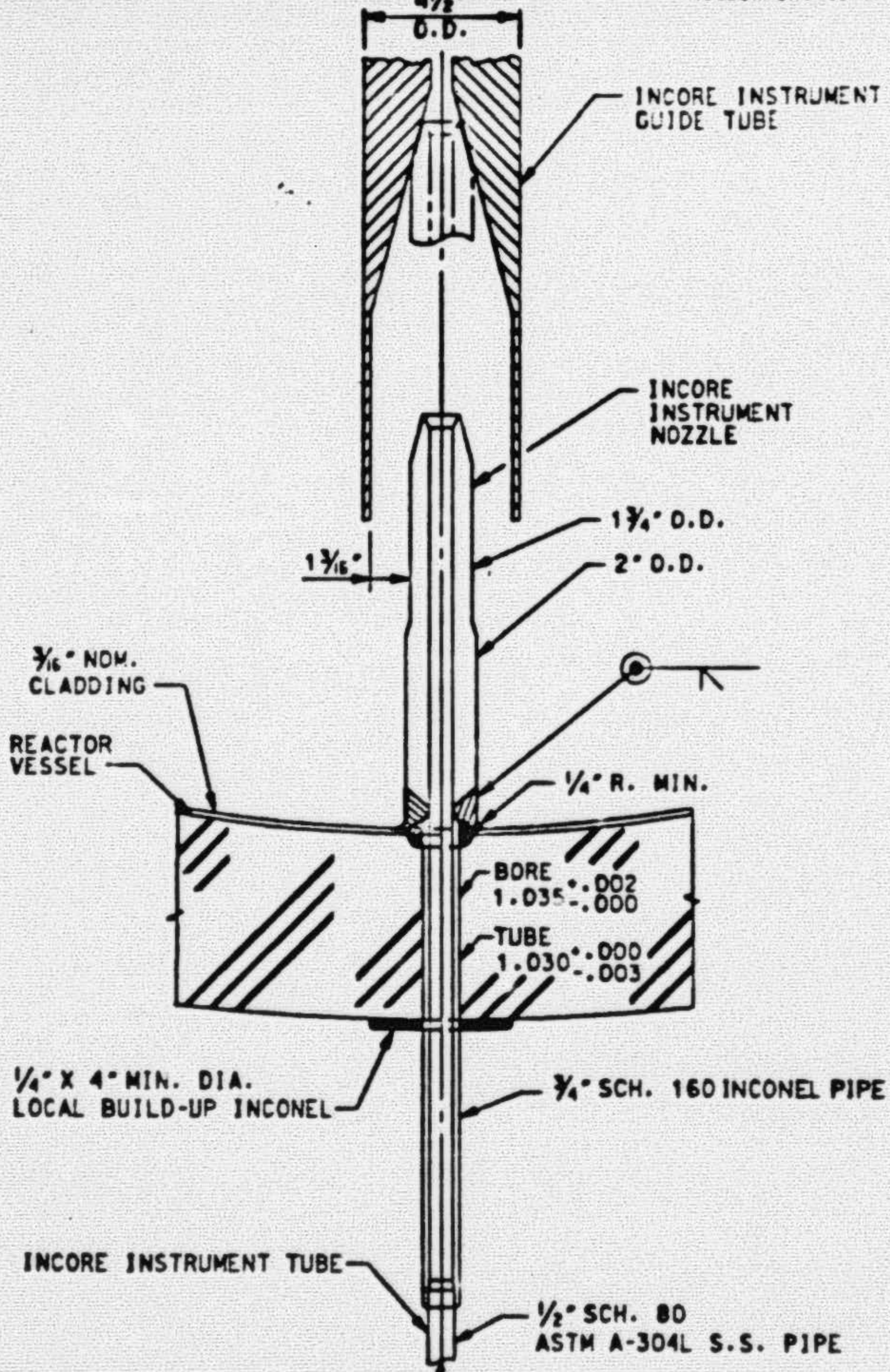
## E. OTHER ISSUES

The staff has also reviewed a proposed matrix which correlates weight and allowable lift heights for an object that if dropped, will not fail the Defueling Work Platform (DWP) once installed. Since the use of this matrix will preclude failure of the DWP for these analyzed load drop accidents, we therefore concur with its implementation.

The staff anticipates some conditions where the height/weight formulas in Cases 1 through 4 of the licensee's submittal are not satisfied. When these situations occur, the associated lift procedures should be submitted to the staff for review and approval prior to the operation (e.g., movement of the tripod over the vessel).

## F. 50.59 EVALUATION

The staff concludes that based on the criteria of 10 CFR 50.59, the planned activity is not an unreviewed safety issue. It will not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important-to-safety previously evaluated. It also does not create the possibility for an accident or malfunction of a different type than any evaluated previously or reduce the margin of safety. (See the staff's April 23, 1985 Amendment of Order, July 17, 1984 Head Lift SER, the licensee's FSAR.)




INCORE INSTRUMENT GUIDE TUBE/ NOZZLE INTERFACE

FIGURE 1