

January 9, 1984  
NRC/TMI-84-003

MEMORANDUM FOR: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
  
Bernard J. Snyder, Program Director  
TMI Program Office

FROM: Lake H. Barrett, Deputy Program Director  
TMI Program Office

SUBJECT: NRC TMI PROGRAM OFFICE WEEKLY STATUS REPORT FOR  
December 18, 1983 - January 7, 1984

Data from effluent and environmental monitoring systems indicated no plant releases in excess of regulatory limits. Waste shipments continued on a routine basis. Plant parameters showed no significant changes. The reactor coolant system is depressurized and RCS level remains at 321'6". The NRC staff has issued a draft PEIS supplement on the TMI-2 cleanup, including revised occupational exposure estimates.

Site activities this period included: Auxiliary and Fuel Handling Building decontamination, "A" spent fuel pool refurbishment, purification demineralizer sampling preparations and procedure review. Reactor building entries were made in support of technical specifications and miscellaneous tasks. (For more details see appropriate paragraphs below.)

Significant items covered in the enclosure are:

- Reactor Building Activities
- Spent Fuel Pool "A" Refurbishment
- Auxiliary and Fuel Handling Building Activities
- Waste Management Activities
- Makeup and Purification Demineralizer Status
- TMI Occupational Dose
- Public Meetings

Data summary sheets included in this report are:

- Liquid Effluent Data
- Environmental Data
- Radioactive Material/Radwaste Shipment Data
- Water Processing Data
- Plant Status Data
- Draft PEIS Supplement Information

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ORIGINAL SIGNED BY: *+*  
Philip J. Grant  
Lake H. Barrett  
Deputy Program Director  
TMI Program Office

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TMI  
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FILE			for		
NAME					
DATE	Enclosure:	As stated			

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## ENCLOSURE

### REACTOR BUILDING ACTIVITIES:

A reactor building recovery schedule is being developed based on projected funding for 1984. Reactor building activities were constrained by funding limitations in late 1983. Weekly entries will continue in early 1984 to meet technical specification requirements for reactor coolant system water samples for boron analysis. Major activities identified for early 1984 include polar crane rail repairs, canal seal plate modification and partial detensioning of the reactor vessel head closure studs. The polar crane load test is tentatively scheduled to be completed by late April 1984.

### SPENT FUEL POOL 'A' REFURBISHMENT:

Six of eighteen shield slabs have been removed from over the pool. Two more slabs will be removed before work on pool refurbishment is curtailed in order to apply additional resources to head lift preparations in the reactor building.

### AUXILIARY AND FUEL HANDLING BUILDING ACTIVITIES:

Work on the expansion of the 328 ft. elevation decontamination facility continued. Full operation of the facility should occur in a few weeks following completion of functional testing of the vibratory finisher and training of personnel in the operation of specialized equipment.

Work is continuing on decontamination and painting of the corridors in the auxiliary and fuel handling buildings so that these areas may be radiologically released. Those corridors that have been decontaminated and repainted are being maintained at less than 500 DFM per 100 cm<sup>2</sup>. Some cubicle flushing was also carried out. Most decontamination work is proceeding at a reduced pace due to funding limitations.

The initial results of the foam decontamination system tests indicate that the foam can be effectively applied to surfaces and that tests on contamination removal are being planned.

### WASTE MANAGEMENT ACTIVITIES:

SDS liner D20037 is scheduled for shipment to Rockwell Hanford on January 12, 1984. This waste liner, which will be loaded with a hydrogen/oxygen gas recombiner, will be the 15th SDS waste liner in a group of 19 scheduled to be shipped to Hanford, Washington.

### MAKEUP AND PURIFICATION DEMINERALIZER STATUS:

Preparations continue for the removal of the radioactive resins from the Auxiliary Fuel Handling Building makeup and purification demineralizers in late 1984. The NRC TMIPO staff approved the safety evaluation report for water addition, nitrogen sparging and sampling of the "A" demineralizer. Removal of a resin sample from the "A" demineralizer is planned for early February.

TMI OCCUPATIONAL DOSE:

Licensee TLD (Thermoluminescent Dosimeter) records indicate the following station occupational radiation doses for the period November 1 - November 30, 1983:

Unit 1 and Unit 2 Combined Dose Ranges

<u>Category in Rem</u>	<u>Number of Station Personnel</u>
No Measurable Dose	1,248
Dose Less Than 0.1	240
0.1 to 0.25	28
0.25 to 0.5	6
0.5 to 0.75	1
0.75 to 1	0
1 to 2	0
2 to 3	0

Total Plant (Unit 1 and Unit 2) Dose: 13.7 man-rem

Total Unit 2 Dose: 7.1 man-rem

Total cumulative Unit 2 dose for 1983 (January - November 1983): 351.6 man-rem

PUBLIC MEETINGS:Past Meetings:

1. On January 3, 1984, Dr. Bernard J. Snyder, Program Director TMIPO, participated as an invited speaker at a lecture program for the Johns Hopkins University, School of Public Health, Baltimore, Maryland. The topic of discussion was the impact and lessons learned from the TMI-2 experience, including a discussion of the recently revised estimates of projected worker exposure made by the NRC staff.
2. On January 5, 1984, the NRC TMIPO staff held a press briefing to announce the issue of the draft Supplement 1 to the Programmatic Environmental Impact Statement (PEIS, NUREG-0683, Supplement 1) which revised the estimated occupational dose that could result from the completion of the cleanup and the associated environmental impacts. A copy of the NRC press release and slides used during the briefing are attached as Appendix 6. As noted in the press release, single copies of the draft Supplement may be obtained by writing to the Director, Division of Technical Information and Document Control, U.S. Nuclear Regulatory Commission, Washington, DC 20555, or the Deputy Program Director, NRC TMI Program Office, P.O. Box 311, Middletown, PA 17057. The NRC TMIPO staff is also planning to hold public meetings to discuss the draft Supplement. These meetings will be announced in the TMI Weekly Status Reports. The staff welcomes comments from the public on the draft Supplement. All comments will be reviewed and taken into consideration when the NRC staff prepares the final Supplement to the PEIS. The comments should be received by February 29, 1984, and addressed to Dr. Bernard J. Snyder, Program Director, TMI Program Office, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Future Meetings:

1. On January 12, 1984, Lake Barrett will meet with the Concerned Mothers of Middletown to discuss TMI related issues.
2. On January 12, 1984, the Three Mile Island Unit 2 Advisory Panel will meet from 7:00 PM to 10:00 PM in the Holiday Inn, 23 South Second Street, Harrisburg, Pennsylvania. The meeting will be open to the public. The major topic for the meeting will be 1984 funding of the Unit 2 recovery program. Persons that have questions pertaining to the TMI-2 cleanup that would like to have them considered or addressed by the Advisory Panel and persons desiring the opportunity to speak before the Advisory Panel on TMI-2 cleanup related items are asked to contact, in writing, Mr. Joel Roth, 4705 Carlisle Pike, Mechanicsburg, PA 17055.

APPENDIX 1

LIQUID EFFLUENT DATA

GPU Nuclear

Based on sampling and monitoring, liquid effluents from the TMI site released to the Susquehanna River were determined to be within regulatory limits and in accordance with NRC requirements and the City of Lancaster Agreement.

During the period December 16, 1983 through January 6, 1984 no liquid effluent releases were made from individual sources within Unit 2.

Environmental Protection Agency

Lancaster Water Samples:	14 samples
Period Covered:	December 4 - December 17, 1983
Results:	Gamma Scan Negative
TMI Water Samples:	13 samples
Period Covered:	December 3 - December 16, 1983
Results:	Gamma Scan Negative

APPENDIX 2

ENVIRONMENTAL DATA

EPA Environmental Data

The EPA measures Kr-85 concentrations at several environmental monitoring stations and reported the following results:

<u>Location</u>	<u>November 23 - December 9, 1983</u> (pCi/m <sup>3</sup> )
Goldsboro	*
Middletown	20
Yorkhaven	19
TMI Observation Center	19

\*Insufficient volume for analysis

- No radiation above normally occurring background levels was detected in any of the samples collected from the EPA's air and gamma rate networks during the period from December 13, 1983 through January 3, 1984.

NRC Environmental Data

Results from the NRC continuous air sampler monitoring of the TMI site environment are as follows:

<u>Sample</u>	<u>Period</u>	<u>I-131</u> (uCi/cc)	<u>Cs-137</u> (uCi/cc)
HP-398	December 14, 1983 - December 21, 1983	<8.3 E-14	<8.3 E-14
HP-399	December 21, 1983 - December 21, 1983	<8.6 E-14	<8.6 E-14
HP-400	December 28, 1983 - January 4, 1984	<8.6 E-14	<8.6 E-14

### APPENDIX 3

#### RADIOACTIVE MATERIALS/RADWASTE SHIPMENT DATA

- On December 17 1983, a HN-100 Type A cask containing mechanical filters from TMI-1 was shipped to U.S. Ecology, Hanford Burial Site, Richland, Washington.
- On December 19, 1983, a HN-100 Type A cask containing solidified resin from TMI-1 was shipped to Chem-Nuclear Systems, Inc., Barnwell, South Carolina.
- On December 23, 1983, 106 drums of contaminated laundry from TMI-1 and TMI-2 were shipped to Interstate Uniform Service, New Kensington, Pennsylvania.
- On December 28, 1983, two boxes containing four 1-liter liquid samples, two sump smears and two scintillation vials from TMI-1 were shipped to Teledyne Isotopes, Westwood, New Jersey.
- On December 30, 1983, 66 drums of contaminated laundry from TMI-1 and TMI-2 were shipped to Interstate Uniform Service, New Kensington, Pennsylvania.
- On January 5, 1984, two drums containing a PORV and code safety valves from TMI-1 were shipped to Wyle Laboratories, Huntsville, Alabama.
- On January 6, 1984, 62 drums of contaminated laundry from TMI-1 and TMI-2 were shipped to Interstate Uniform Service, New Kensington, Pennsylvania.



APPENDIX 4

WATER PROCESSING DATA

Submerged Demineralizer System (SDS)

SDS processed Batch 68 consisting of approximately 56,000 gallons of water from the B Bleed Tank. The performance parameters are shown below.

SDS Performance Parameters  
December 17, 1983 to January 2, 1984

<u>Radionuclide</u>	<u>Average Influent</u> (uc/ml)	<u>Average Effluent</u> (uc/ml)	<u>Percent Removed</u>
Cesium 137	9.19 E-1	5.98 E-5	99.99
Strontium 90	5.51 E-1	1.37 E-2	97.51

EPICOR II

During the period of December 17, 1983 to January 1, 1984, EPICOR processed six batches of water from the A and B monitor tanks. Batch 196 (10,962 gallons), Batch 198 (10,270 gallons) and batch 200 (5,000 gallons) were from the A monitor tank. Batch 195 (10,261 gallons), batch 197 (5,000 gallons) and batch 199 (11,498 gallons) were from the B monitor tank. The averages of the performance parameters for each batch are shown below.

EPICOR Performance Parameters  
December 17, 1983 to January 1, 1984

<u>Radionuclide</u>	<u>Average Influent</u> (uc/ml)	<u>Average Effluent</u> (uc/ml)	<u>Percent Removed</u>
Cesium 137	2.4 E-5	1.4 E-7	99.4
Strontium 90	9.1 E-3	9.4 E-6	99.9
Antimony 125	2.0 E-4	2.8 E-7	99.9

## APPENDIX 5

### PLANT STATUS

Core Cooling Mode: Heat transfer from the reactor coolant system (RCS) to Reactor Building ambient.

Available Core Cooling Mode: Mini Decay Heat Removal (MDHR) system.

RCS Pressure Control Mode: N/A

Major Parameters as of 5:00 AM, January 6, 1984 (approximate values):

Average Incore Thermocouples\*: 84°F  
Maximum Incore Thermocouple\*: 95°F

RCS Loop Temperatures:

	A	B
Hot Leg**	59°F	63°F
Cold Leg (1)	55°F	60°F
(2)	55°F	60°F

Reactor Core Decay Heat: 20.5 Kilowatts

RCS Pressure: 0 psig

Reactor Building: Temperature: 56°F  
Pressure: -0.15 psig  
Airborne Radionuclide Concentrations:

2.9 E-8 uCi/cc H<sup>3</sup> (Tritium)  
(sample taken 1/3/84)

2.7 E-9 uCi/cc particulates  
(predominately Cs-137)  
(sample taken 1/3/84)

\*Uncertainties exist as to the exact location and accuracy of these readings.  
\*\*Since the RCS draindown, hot leg temperature detectors are above water level.



# UNITED STATES NUCLEAR REGULATORY COMMISSION

OFFICE OF PUBLIC AFFAIRS, REGION I  
631 Park Avenue, King of Prussia, Pa. 19406

o. I-84-1  
ontact: Karl Abraham  
Brian Norris  
el: 215/337-5330  
337-5000

January 5, 1984

## NRC STAFF ISSUES DRAFT SUPPLEMENT TO ENVIRONMENTAL STATEMENT ON TMI 2 CLEANUP

The Nuclear Regulatory Commission staff is issuing, for public comment, a draft supplement to its Programmatic Environmental Impact Statement dealing with the cleanup of Three Mile Island Unit 2.

The draft supplement deals with revised estimates of the total radiation doses to workers which will result from the cleanup program. The dose estimates have been revised upward since the final statement was issued in March 1981.

When the final statement was prepared, the reactor building had been entered only five times. The draft supplement has been prepared based on the increased knowledge obtained through over 280 reactor building entries by cleanup workers. This information includes the actual condition inside the reactor building, the extent and characterization of radioactive contamination on surfaces and, in general, the complexity of cleanup tasks which are more difficult because of the delays of cleanup since the accident.

The staff now believes that the total radiation dose to workers engaged in the cleanup effort will range between 13,000 and 46,000 person rem. (A person rem is a measure of radiation dose to a group of people. For example, if a group of 10 individuals each received a radiation dose of one rem, the total dose would equal 10 person rem.) The original estimates put the total dose at between 2,000 and 8,000 person rem.

Using internationally accepted measures of evaluating health risk, the staff estimates that, on a statistical basis, the health effects to the cleanup workers over their lifetimes will be from two to six additional premature deaths from cancer and from three to 12 additional genetic effects among the offspring of the workers. To put this risk into proper perspective, it should be compared with the non-cleanup related normal risks of fatal cancer and genetic effect. Public health statistics show that, for the entire U.S. population, presently there is a one in five probability that death will be due to some form of cancer and a normal occurrence of genetic effect in the offspring of U.S. population is about one in 100. This means that for a hypothetical number of 10,000 cleanup workers, the non-cleanup related normal incidences of fatal cancer and genetic effect among their offspring is about 100 and 1,100, respectively.

(MORE)

In preparing the draft supplement, the staff considered three alternative approaches to the current cleanup program and the impact each would have on total radiation doses to workers. The current plan calls for a dose-reduction program (installation of temporary shielding and removal of some equipment) followed by defueling of the reactor, then decontamination of the primary cooling system and final building cleanup.

The first alternative would involve more extensive cleanup of the reactor building prior to defueling of the reactor. The second would involve phased defueling which is removal of fuel debris before the reactor head and plenum are lifted. The third would involve defueling the reactor, then placing the reactor building and, possibly, some portions of the auxiliary and fuel-handling buildings into monitored storage until a technology to complete the cleanup using robots is available. Only the latter alternative would reduce significantly radiation doses to workers and the first two would involve delays in defueling which are considered undesirable.

On balance, although estimated radiation doses to workers are higher, the staff still supports its original conclusion that the cleanup should proceed as expeditiously as possible--to reduce the potential for release of radioactive materials to the environment and to assure that TMI 2 does not become a long-term radioactive waste disposal site.

Comments on the draft Supplement 1 to the Programmatic Environmental Impact Statement related to Decontamination and Disposal of Radioactive Wastes Resulting from March 28, 1979, accident, Three Mile Island Nuclear Station, Unit 2 (NUREG-0683) should be received by February 29, 1984. They should be addressed to: Dr. Bernard J. Snyder, Program Director, Three Mile Island Program Office, Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission, Washington, D.C. 20555.

Single copies of the draft supplement may be obtained by writing to the Director, Division of Technical Information and Document Control, Nuclear Regulatory Commission, Washington, D.C. 20555 or the Deputy Director, NRC TMI Program Office, 100 Brown Street, Middletown, Pennsylvania 17057.

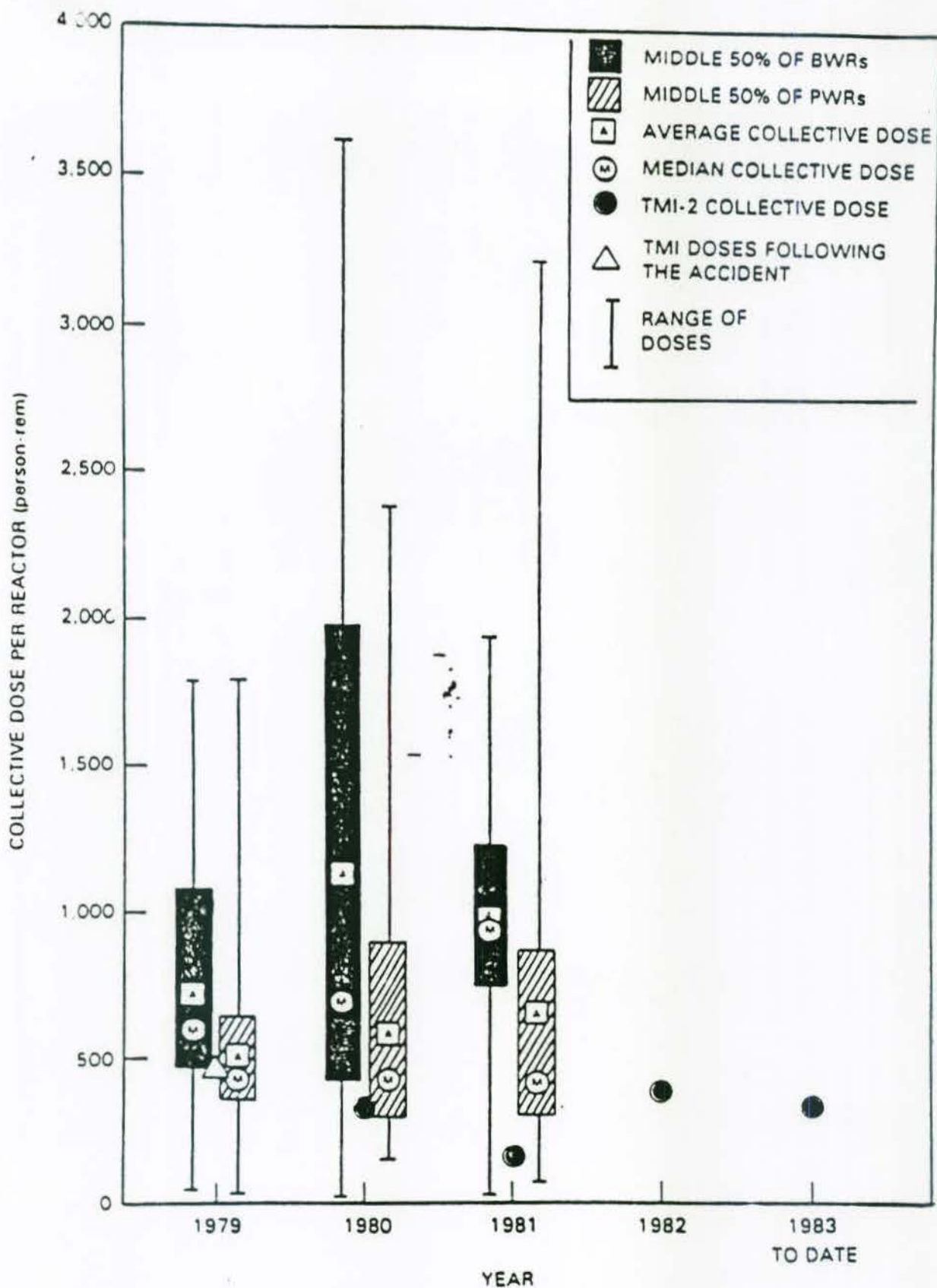
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DRAFT SUPPLEMENT 1 TO THE PEIS

PURPOSE: TO RE-EVALUATE OCCUPATIONAL DOSE

FOR CLEANUP AND ASSESS ENVIRONMENTAL IMPACT

<u>DATE OF ISSUE</u>	<u>DRAFT PEIS</u>	<u>FINAL PEIS</u>	<u>DRAFT SUPPLEMENT 1</u>
	<u>JULY 1980</u>	<u>MARCH 1981</u>	<u>DECEMBER 1983</u>
<u>REACTOR BUILDING ENTRIES</u>	0	5 (JAN. 1981)	280 (AUG. 1983)



Doses at TMI-2 Compared with Doses Per Reactor at All Commercial Nuclear Plants in the United States

MAJOR CLEANUP ACTIVITIES SINCE FINAL PEIS:

*BASEMENT SUMP WATER CLEANUP	1981
*DECONTAMINATION EXPERIMENT	1982
*UNDER REACTOR HEAD DATA	1982 - 83
*DOSE RATE REDUCTION	1982



## DOSE REDUCTION PROGRAM

OBJECTIVE: TO REDUCE GAMMA LEVELS AND AIRBORNE CONCENTRATIONS SUCH THAT WORK TOWARDS DEFUELING IS ALARA

MANAGEMENT: SPECIFIC TASK GROUPS TO IDENTIFY SOURCES, ENGINEER METHODS AND PRIORITIZE TASKS

EXAMPLES OF ACTIONS:  
IDENTIFICATION OF DOSE CONTRIBUTING SOURCES  
SHIELD OR REMOVAL OF SOURCES  
SHIELD FLOOR OPENINGS, PENETRATIONS  
ATTEMPTS TO REDUCE AIRBORNE CONCENTRATIONS  
OTHER ALARA EFFORTS: TRANSIT DOSE REDUCTION  
AIR CHILLERS

TOP OF DOME EL 473'-4 3/8"

EL 447'9"

TOP OF CRANE RAIL  
EL 428'0"

CRANE RAIL

25-TON  
AUX  
HOOK

7'-1"

13'-9"

LIMIT OF MAIN  
HOOK TRAVEL

1'-1"

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500-TON POLAR CRANE

AUX HOOK

CAB

LINER (TYP)

OPEN  
STAIRWELL

PENDANT

PLATFORM

FUEL-  
HANDLING  
BRIDGE

MISSILE SHIELDS

SHIELD EL 370'4"  
EL 387'4"

VERTICAL  
LADDER

STEAM  
GENERATOR

WALKWAY

C/D CABLE  
CHASE

HEAD SERVICE  
STRUCTURE

NEUTRON  
SHIELD  
TANKS  
(REMOVED)

PRESSURIZER

STEAM  
OUTLET

REACTOR  
COOLANT  
PUMP

STEAM  
GENERATOR

REACTOR  
VESSEL

EL 305'0"

EL 282'8"

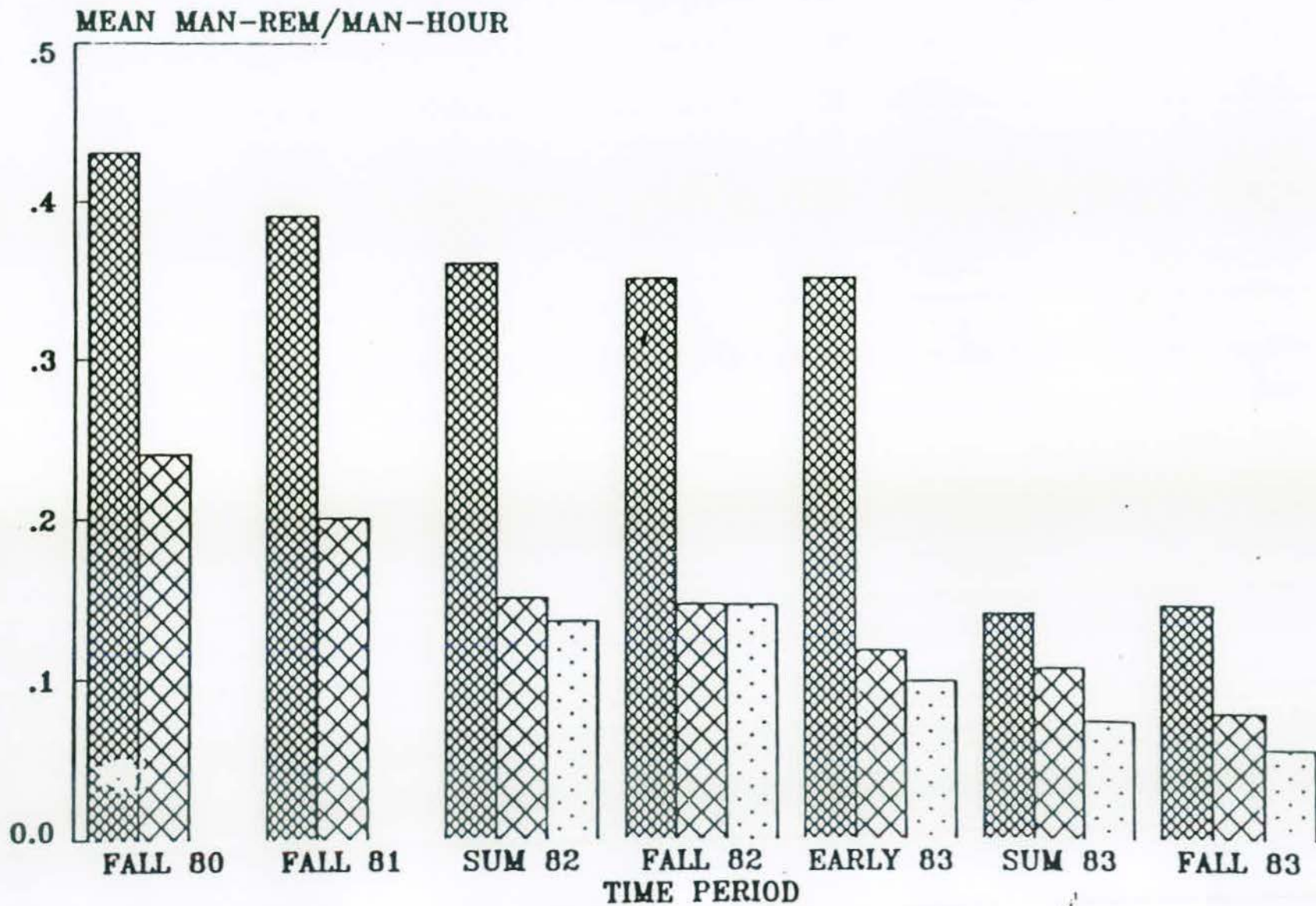
Reactor Building

# THREE MILE ISLAND UNIT II RX BLDG - MEAN MAN-REM/MAN-HOUR

305'  
ELEVATION

347'  
ELEVATION

SERVICE  
STRUCTURE



BASED UPON SELF-READER DOCUMENTATION

CLEANUP ALTERNATIVES EVALUATED:

- \*PRESENT PLAN - DOSE REDUCTION & DEFUEL, BUILDING CLEANUP
- \*ALTERNATIVE 1 - BUILDING CLEANUP, DEFUEL
- \*ALTERNATIVE 2 - DOSE REDUCTION & PHASED DEFUEL, BUILDING CLEANUP
- \*ALTERNATIVE 3 - DOSE REDUCTION & DEFUEL, INTERIM STORAGE, ROBOTICS CLEANUP

ESTIMATED CUMULATIVE OCCUPATIONAL RADIATION DOSE  
ASSOCIATED WITH EACH CLEANUP OPTION (IN PERSON-REM)

	<u>CURRENT CLEANUP PLAN</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>	<u>ALTERNATIVE 3</u>
REACTOR BUILDING AND EQUIPMENT CLEANUP	5,900-21,000	9,000-30,000	5,900-21,000	300-3,500
REACTOR DISSASSEMBLY AND DEFUELING	2,600-15,000	820-6,500	2,600-14,000	2,600-15,000
PRIMARY-SYSTEM DECONTAMINATION	56-970	39-780	56-970	11-190
DOSE REDUCTION	2,000-5,000	0	2,000-5,100	2,000-5,100
OTHER*	2,400-3,800	2,400-4,400	2,600-4,400	2,000-4,400
TOTAL	13,000-46,000	12,000-42,000	13,000-45,000	6,900-28,000

\*ALL OTHER CLEANUP ACTIVITIES, INCLUDING DOSE INCURRED TO DATE (1700 PERSON-REM),

ESTIMATED HEALTH EFFECTS TO CLEANUP WORKERS (1)(2)

FATAL CANCERS	2 - 6
GENETIC EFFECTS	3 - 12

- (1) ESTIMATED RISKS BASED ON 1972 BEIR REPORT. THE RISK ESTIMATORS ARE 131 ADDITIONAL FATAL CANCERS AND 260 ADDITIONAL GENETIC EFFECTS PER 1 MILLION PERSON-REM.
- (2) CURRENTLY, THE PROBABILITY OF DEATH DUE TO CANCER IS 1 IN 5, OCCURRENCE OF HEREDITARY DISEASE IS 1 IN 9. NRC STAFF HAS ASSUMED A MINIMUM OF 10,000 RADIATION WORKERS WILL BE INVOLVED IN THE CLEANUP.

# OCCUPATIONAL HEALTH RISKS

<u>OCCUPATION</u>	<u>DAYS OF LIFE EXPECTANCY LOST FOR EACH YEAR OF WORK</u>
TMI CLEANUP WORKER (4 R/YR)	6 { 4 - RADIATION RISK 2 - NON-RADIATION RISK
MINING	8
CONSTRUCTION	8
AGRICULTURE	7
TRANSPORTATION & UTILITIES	4

## CONCLUSIONS:

- ALL CLEANUP OPTIONS EVALUATED INVOLVE HIGHER OCCUPATIONAL DOSES THAN THOSE ESTIMATED IN THE 1981 PEIS.
- THE MOST DOSE-INTENSIVE TASK IS REACTOR BUILDING CLEANUP. ONLY MEANS FOR SUBSTANTIAL REDUCTION IS EXTENSIVE USE OF ROBOTIC TECHNOLOGY WHICH IS CURRENTLY NOT AVAILABLE.
- EARLY DECISION TO USE ROBOTICS IS NOT NECESSARY WHEN DEFUELING OCCURS PRIOR TO EXTENSIVE BUILDING CLEANUP.
- CURRENT PLAN PROVIDES THE MOST LIKELY PATH FOR EARLY FUEL REMOVAL. OTHER ALTERNATIVES WOULD CAUSE UNWARRANTED DELAYS IN FUEL REMOVAL.
- THE DOSE REDUCTION PROGRAM HAS SIGNIFICANT POTENTIAL FOR LOWERING TOTAL DOSE. CONSISTENT WITH THE ALARA PRINCIPLE, COMMITMENT ON THIS EFFORT SHOULD CONTINUE.
- CONCLUSION OF PEIS THAT CLEANUP SHOULD PROCEED AS EXPEDITIOUSLY AS REASONABLY POSSIBLE TO ENSURE THE LONG-TERM HEALTH AND SAFETY OF THE PUBLIC REMAINS VALID.