TMI Unit-2 Technical Information & Examination Program

UPDATE

April 15, 1980

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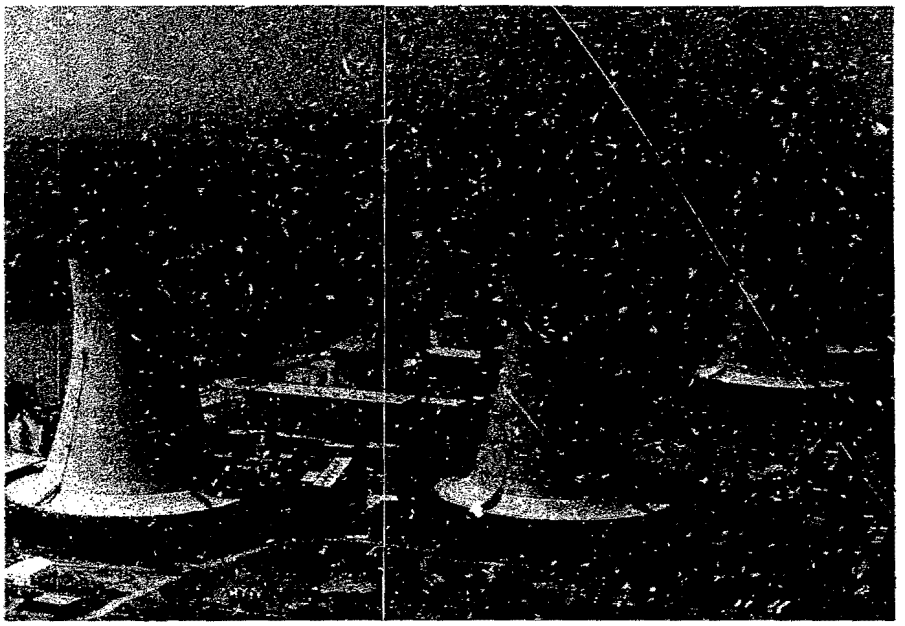
TMI Offers Unique Opportunity

Researchers are taking advantage of the unique opportunities offered by the TMI Unit-2 accident that occurred on March 28, 1979. Damage to the reactor core and the release of fission products within the system give researchers the opportunity to:

- measure the performance of instrumentation, electrical, and mechanical equipment within the reactor containment building during and after the accident,
- determine physical damage to surfaces, components, and equipment resulting from radiation exposure,
- assess core damage for metallurgical and physical behavior of fuel, clad, and core components during and after the accident, and
- assess new technological developments for decontamination and the disposal of radioactive waste.

These activities will add to current knowledge on light-water-reactor behavior following accidents involving core damage. The results could lead to improvements in plant safety, reliability, regulation, and operation. Also, the information will benefit those engaged in the design, construction, operation, and maintenance of nuclear power plants.



Three Mile Island—Location of the nation's most severe commercial nuclear power plant accident.

TMI Unit-2 Technical Information and Examination Program Update

This first publication of the *TI & EP Update* introduces the TMI-2 Technical Information and Examination Program.

The *Update* is specifically designed to highlight data and information obtained as a part of the TMI-2 Information and Examination Program. Since this is the initial *Update*, our intent is to provide an introduction of the program. The *Update* will be issued as sufficient data or information is obtained to justify publication. Only summaries will be provided in the *Update*; however, more detailed information will be available in a data bank which is currently under development. In a later *Update*, a procedure for obtaining this information will be outlined. We hope these mechanisms satisfy requirements of all interested individuals and organizations for data and information from this program.

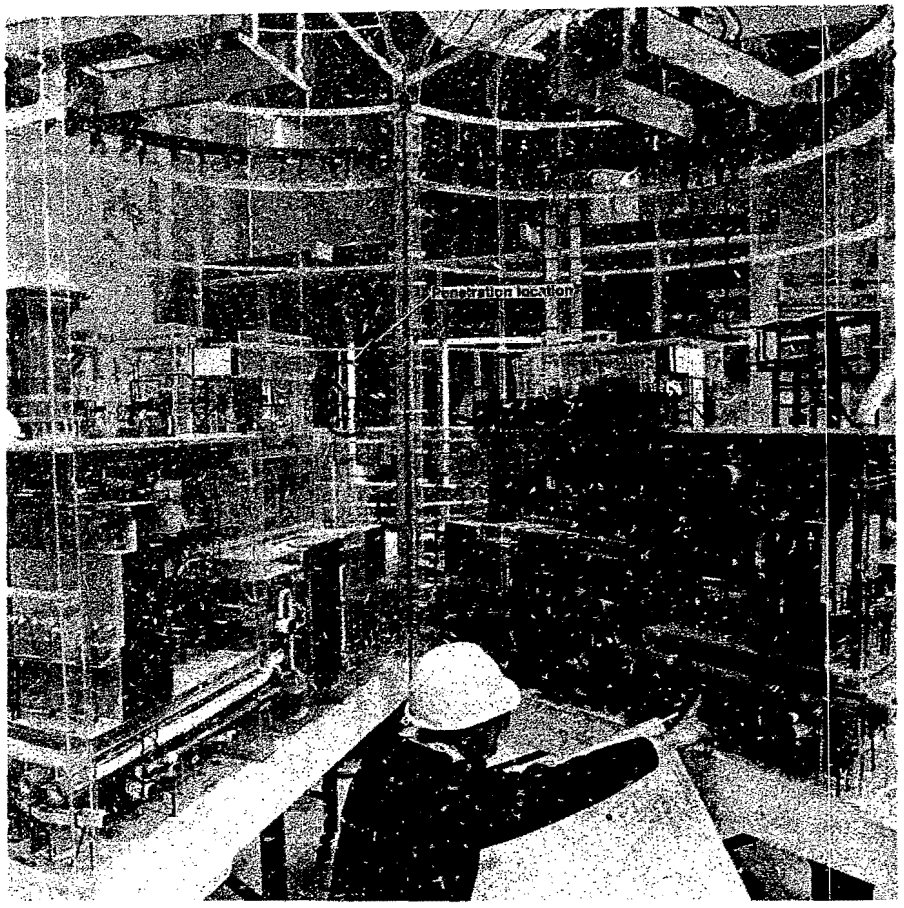
Interested individuals and organizations can obtain a complimentary subscription by filling out the form on the inside pages and mailing it to *TI & EP Update*, EG&G Idaho, Inc., P.O. Box 88, Middletown, PA 17057.

Participants Form Information and Examination Program; Seek Generic Data from Unit-2 Accident

Four groups, with a common interest in obtaining valuable generic information from the TMI Unit-2 accident, jointly established the TMI Unit-2 Information and Examination Program. The Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), the Electric Power Energy Research Institute (EPRI), and the General Public Utilities Company (GPU) signed a coordination agreement on March 26, 1980, which documents these common interests.

EG&G Idaho, Inc., has staffed the Technical Integration Office (TIO) which reports to Dr. Willis W. Bixby, the DOE Manager of the TMI Site Office. The TIO is responsible for the day-to-day management of the Information and Examination Program.

The TIO staff and their respective areas of responsibility are as follows: Harold M. Burton, EG&G Program Manager; Gregory R. Eidam, Radiation and Decontamination Technical Coordinator; Robert E. Holzworth, Mechanical Systems and Rad Waste Technical Coordinator; James W. Mock, Instrumentation and Electrical Systems Technical Coordinator; Dennis E. Owen, Fuels Technical Coordinator; Frank J. Kocsis, Configuration and Document Control Technical Coordinator; Joseph R. Kerscher, Planning, Scheduling, and Budgets Coordinator; Donna L. Morris, Material and Contracts Coordinator; and Marilyn R. Rehbogen, Secretary.



Model of TMI Unit-2 containment building shows penetration location.

Camera, Radiation Probe Explore Containment

Since the accident, the TMI Unit-2 containment building has been dark and inaccessible except through the eye of a small video camera.

On November 10, 1979, a nine-inch diameter hole was drilled through an inner flange of an existing spare penetration (see the photograph above), and a video camera, an associated strobe light, and a radiation probe were inserted into the containment through the opening. During that day, more than two hours of video taping was done. The camera, equipped with a zoom lens and capable of scanning 360 degrees, relayed good quality video tape information, but was limited in range and did not permit inspection of the water surface.

Radiation readings from the installed probe were taken on November 11, 1979. Gamma radiation levels were in the 3 to 5 rem per hour range, and beta radiation levels were in the range of 400 rems per hour.

At present, Metropolitan Edison Company is documenting the results and conclusions from the review of the tapes. Initial reviews do not show any structural damage. Final evaluation is forthcoming and preparations are being made for initial entry into the containment.

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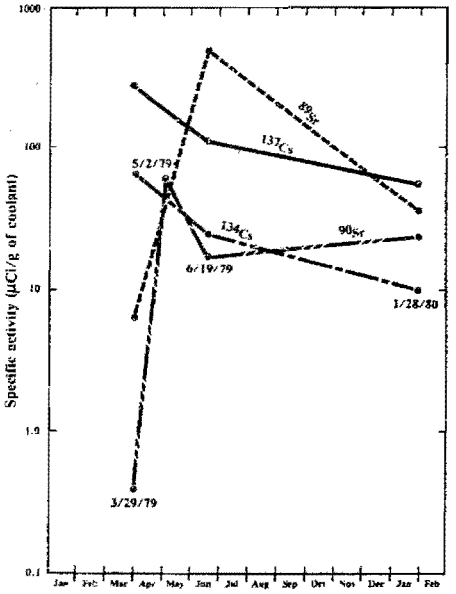
B&W Samples Reactor Building

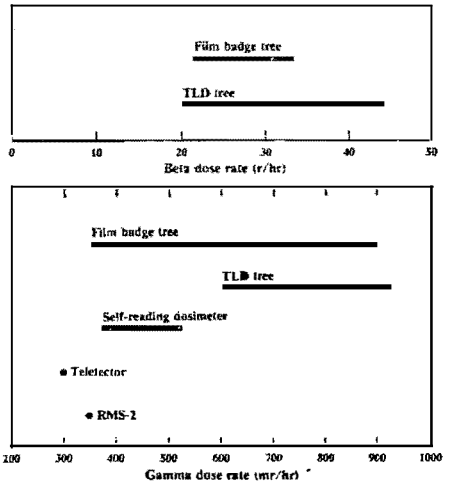
Reactor coolant has been sampled regularly since the TMI Unit-2 accident and then analyzed by Babcock & Wilcox for specific radioisotope activity. Data collected from the samples will be used in the fission product transportation and deposition task, part of the Technical Information and Examination Program. The graph below shows some sample results.

Babcock & Wilcox analyzed other samples in the reactor building such as the sump on October 20, 1979 (see the table to the right), and the air on February 13, 1980. The sample from the reactor building air documented specific radioisotope concentrations (e.g., ^{85}Kr activity of 1 μCi/ml, ^{134}Cs activity of $< 7 \times 10^{-6}$ μCi/ml, ^{137}Cs activity of $< 3.2 \times 10^{-5}$ μCi/ml).

The owner of TMI Unit-2, the General Public Utilities Company, measured the radiation in the reactor building on December 14, 1979, as one of the many preparatory steps for entry into the reactor, and to provide basic planning information for subsequent decontamination efforts. The measurements were performed through a shaft called Penetration R-626, using various instruments (see the chart below). The calculated dose rate to the skin, based on the observed beta dose in the building, lies within a range of 100 to 350 rad/hr.



TMI-2 reactor coolant samples reveal radioisotope concentrations.



Different instruments show dose rates inside the TMI-2 reactor building.

Reactor Building Sump Sample Analysis Results

Analysis		Result
Unfiltered:		
^{137}Cs	(μCi/g solution)	136
^{134}Cs	(μCi/g solution)	27
Filtrate:		
Na (ppm)		1250 ± 100
Cl (ppm)		10 ± 2
B (ppm)		1690 ± 40
pH		8.6 ± 0.2
^{90}Sr	(μCi/g solution)	4.8 ± 1.2
^{137}Cs	(μCi/g solution)	135
^{134}Cs	(μCi/g solution)	26
^{3}H	(μCi/g solution)	0.92
Gross Alpha	(μCi/g solution)	$< 1 \times 10^{-6}$
Gross Beta	(μCi/g solution)	149
Sr-89	(μCi/g solution)	37 ± 4
Filterable Solid (μCi/g solution):		
^{137}Cs		0.2
^{134}Cs		0.03
^{103}Ru		3.0×10^{-3}
^{140}La		8.0×10^{-3}
^{144}Ca		3.0×10^{-3}
^{95}Zr		1.0×10^{-3}
^{95}Nb		4.0×10^{-3}
^{54}Mn		7.0×10^{-5}

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Oak Ridge Analyzes "Cookie" from Containment Building

A disc (cookie) was cut from a shaft called Penetration R-626 in the TMI Unit-2 reactor containment building. Oak Ridge National Laboratory analyzed the 9-in. Type-304 "cookie" made of stainless steel.

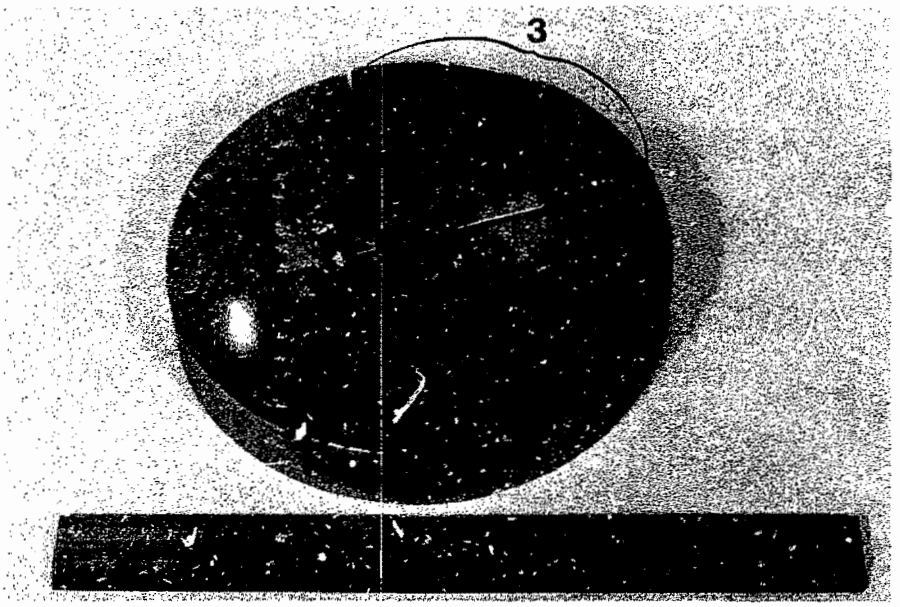
The test results indicated that significant amounts of surface contamination may remain following the decontamination process; however, the decontamination method described below reduced the background radiation levels due to surface contamination to about 1 to 2 mr/hr beta-gamma.

When Oak Ridge received the disc, the initial radiation readings were 80 mr/hr beta-gamma and 6 mr/hr gamma at 2 in. from the disc surface. See the table at the right for the analysis results.

The disc was cut into sections (refer to the photograph) for decontamination tests. The standard Bechtel Corporation Specification CP-952 decontamination series removed approximately 98% of the contamination from piece 3c. Wiping with dry cheesecloth removed approximately 38% of the activity from piece 3a, while wiping with wet cheesecloth removed 17% of the activity from piece 3b. The apparent inconsistency between the wet- and dry-cheesecloth methods may be due to nonuniform contamination levels on the disc surface.

Penetration R-626 Surface Contamination Results

Isotope	Total Activity on Disc (in μCi)	Average Contamination Level on Disc (in μCi/cm^2)
^{60}Co	0.019	6.09×10^{-5}
^{134}Cs	2.68	8.4×10^{-3}
^{137}Cs	12.7	4.0×10^{-2}



Penetration R-626 "cookie" is sectioned for decontamination tests.

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