Nuclear

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May 14, 1984

TMI Program Office
Attn: Dr. B. J. Snyder
Program Director
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Dr. Snyder:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Advisory Committee on Reactor Safeguards (ACRS) Subcommittee
on Reactor Radiological Effects Regarding the TMI-2 Cleanup

In response to your letter of April 10, 1984, attached please find GPU Nuclear's response to the ACRS Subcommittee on Reactor Radiological Effects' comments regarding the TMI-2 cleanup.

If you have any questions concerning this information, please call Mr. J. J. Byrne of my staff.

Sincerely,

B. K. Kanga
Director, TMI-2

BKK/RDW/jep

Attachment

cc: Deputy Program Director - TMI Program Office, Mr. L. H. Barrett

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1. ACRS SUBCOMMITTEE COMMENT

The TMI-2 GPU Recovery Staff appeared to be professional in their approach and they were thorough in their presentations. However, they do not appear to have on their staff (or serving as consultants to them) an adequate number of people who have had previous direct experience in nuclear facility cleanup operations. The Subcommittee believes that the provision of such expertise would be helpful.

GPUNC RESPONSE

The TMI-2 Recovery Project consists of GPU Nuclear Corporation and two major Bechtel contractors (i.e., Bechtel National, Inc. and Bechtel Northern American Power Company) as well as a number of other contractor personnel. A total of seven hundred personnel (700) are involved full-time on the recovery effort including 297 from GPU Nuclear Corporation, 65 from Bechtel National Inc., (BNI), 130 from Bechtel Northern American Power Company (BNAPC) and other miscellaneous contractors. In aggregate, the recovery team represents in excess of 600 man-years of nuclear decontamination experience. Additionally, the TMI-2 Radiological Controls Division is comprised of 107 personnel including engineers, scientists, and technicians. Collectively, this group possesses 780 man-years of radiation protection experience. Thirteen (13) of the scientists and engineers in this group have been directly involved in major radiological decontamination activities representing over 40 man-years of experience in this subject area alone.

Examples of relevant experience in nuclear facility cleanup operations being applied by personnel in participating divisions to the TMI-2 cleanup include:

-- Participation in SL-1 cleanup at Idaho Falls National Engineering Laboratory
-- Supervision of cleanup of a radiopharmaceutical facility operated by Mallingkrodt Chemical Company
-- Supervision of cleanup operations at a depleted uranium processing facility
-- Supervision of multiple cleanup operations subsequent to nuclear weapons testing
-- Participation in nuclear naval reactor cleanup operations
-- Decontamination and decommissioning of a major by-product facility at New England Nuclear Corporation
-- Supervision and participation of cleanup activities associated with decontamination of the Shippingport Nuclear Reactor facilities during the changeover from water to sodium cooling
-- Supervision of cleanup of research reactor facilities at Wright Patterson Air Force Base
-- Supervision of cleanup of an IBM tritium research facility in Binghamton, New York
-- Project management for major cleaup of a Radium-226 dial painting factory in Pittsburgh, Pennsylvania

-- Decontamination and decommissioning of the following facilities: Industrial Reactor Laboratories; Saxton Nuclear Experimental Reactor (DPR-4); Homogenous Reactor Experiment (HRE) at Oak Ridge National Laboratory (ORNL); Experimental Breeder Reactor (EBR-1), Mark III, Idaho; Organic Moderated Reactor Experiment (OMRE), Idaho; Special Power Reactor Excursion Tests (SPERT) at Idaho Nuclear Engineering Laboratory; Cheswick and Battelle Columbus plutonium fuel fabrication; Ames Research Reactor; and Curtis Wright Test Reactor
-- Decontamination of facilities used for production of commercial devices using Americium-241
-- Decontamination of hot cells used with Cobalt-60 and Californium-252
-- Decontamination of by-product research laboratories using Phosphorus-32, Iodine-131, and Tritium
-- Radioactive facilities deactivation of the Knolls Atomic Laboratory
-- Decommissioning and cleanup activities at Ingalls Shipyards under the guidance of the Naval Nuclear Power Program
-- Supervision of cleanup activities at the Materials Testing Reactor and Engineering Test Reactor which are test facilities for advanced fuels operating under adverse conditions
-- Cleanup of an experimental critical facility containing fissile material for Bettis Atomic Power Laboratory

In addition, in order to obtain state-of-the-art technology in facility decontamination for TMI-2, the Department of Energy (DOE) and the Electric Power Research Institute (EPRI) convened a "Facility Decontamination Workshop" on November 27, 28, and 29, 1983, in Hershey, Pennsylvania. Leading decontamination experts from the national laboratories, Battelle Northwest, United Nuclear Corporation, United States Air Force, United States Navy, National Lead, Vikem and Chem Nuclear Systems, Inc., participated in the conference. The published results of the conference became "Facility Decontamination Technology Workshop", GEND-0002, and formed the basis for decontamination planning at TMI-2.

The TMI-2 project evaluated the results of the conference, brought together a team of experts, and created the decontamination planning documents. The Technical Plan for Reactor Building Gross Decontamination and associated documents were written and reviewed by this group.

Based upon the above, GPU Nuclear believes that the TMI-2 project team consists of a professional staff with the knowledge and experience necessary to safely and effectively conduct and complete the decontamination of TMI-2.

2. ACRS SUBCOMMITTEE COMMENT

The discussions of the cleanup at TMI-2 clearly indicated that Cs-137 accounts for a major part of the external exposures that are occurring and those that are projected in terms of the collective occupational doses for the total cleanup operation.

Accordingly, the Subcommittee urges that GPU obtain the services of professional personnel expert in the chemical behavior of cesium so that they can effectively address the problems represented by this radionuclide. They apparently do not now have such expertise.

GPUNC RESPONSE

TMI-2 recognized early after the accident that the primary gamma dose contributor for personnel would be radiocesium. The Technical Advisory Group (TAG) was formed under the direction of B. Rusche, with R. Wallace and C. Ice of Savannah River Laboratory and R. Brooksbank, D. Campbell, A. Malinauskus, and E. Collins of ORNL participating, to provide the insight necessary to effectively address the unique waste management problems at TMI-2. The ORNL team was responsible for the selection of the zeolite beds for use in the Submerged Demineralizer System (SDS) cesium removal and for conceptualizing the engineering flowsheet for the SDS.

In recognition of the unique problems that radiocesium presented, R. Brooksbank, a recognized expert on radiocesium, now participates as a member of the GPU Nuclear General Office Review Board (GORB). Later, in a parallel consulting assignment, the Technical Assistance and Advisory Group (TAAG), in January 1982, drew upon the expertise of D. Campbell and A. Malinauskus to provide a highly specialized radiochemistry capability. E. Collins currently serves in this capacity.

Additionally, Dr. J. Silverman, Professor and Director of the Institute for Physical Science and Technology, University of Maryland, acts as consultant to the recovery effort in the areas of chemistry, radiochemistry, radiation chemistry, physics, and radiological effects and protection. Also, Dr. K. Hofstetter, GPU Nuclear Site Operations and Dr. V. Baston, GPU Nuclear Site Engineering are full-time employees in the recovery effort.

3. ACRS SUBCOMMITTEE COMMENT

There appear to be several aspects of the recovery operations wherein a better understanding of the radiation protection problems and a better knowledge of more effective control measures would be helpful. These aspects include:

A. Nature of Airborne Radionuclides:

In connection with potential internal exposures of workers within TMI-2 containment, there is a need to specify the radionuclide composition of the various airborne particulates according to particle size. This has not apparently been done, yet it is essential to the assessment of the accompanying potential health hazard. The Subcommittee believes that studies should be undertaken to more clearly delineate the nature of the airborne radionuclides.

B. Internal Versus External Exposures

Workers entering containment for decontamination and recovery operations are currently required to wear full-scale protective equipment, including respirators. Closer examination of the increased external exposures, because of the impediments caused by the utilization of protective equipment, might show that it would be better to alter this approach (such as working faster without protective equipment). This needs further evaluation.

GPUNC RESPONSE TO COMMENT 3A

Formal studies have been underway since September 1983 to establish the aerodynamic qualities of airborne particulates within the TMI-2 Reactor Building. These studies have incorporated the use of multi-stage stack type samplers which separate particles based on activity median aerodynamic diameter (AMAD). The studies are designed to answer the following questions:

-- What is the respirable fraction of airborne radioactive particulates?

-- What is the effect on airborne radioactivity of using borated water for building decontamination by spraying?

-- What is the isotopic composition of airborne radionuclides as a function of AMAD?

To date, over twenty series of measurements for radioactivity weighted particle size have been completed. The data are under evaluation. These studies will continue as different activities are conducted within the Reactor Building. The results of the analyzed data will be correlated to work activity in the Reactor Building.

GPUNC RESPONSE TO COMMENT 3B

The TMI-2 Radiological Controls Division recently conducted an evaluation of the impact of respirator usage on TMI-2 recovery and cleanup efforts. The study endeavored to determine whether the wearing of respiratory protection equipment reduced worker efficiency.

The study results indicated that the the powered air-purifying respirator (PAPR) used at TMI-2 does not decrease worker efficiency. The PAPR utilizes a battery powered blower to provide a constant flow of highly filtered air into the facepiece of the respirator. The air flow serves to cool the worker and minimizes facial perspiration. The PAPR provides minimal breathing resistance as compared to conventional negative pressure respirators. Discussions with workers indicated that the advantages of PAPR included freedom from worry regarding inhalation of radioactivity and the need to take extra care about potential facial contamination from inadvertent wiping or scratching of the face. Consequently, employees

opined that they were able to work rapidly without concern for airborne radioactivity levels in the vicinity of the breathing zone. Of the persons contacted, many felt that the major disadvantage of respirator usage was restricted peripheral vision; however, the comfort and freedom from concern over contamination were benefits which outweighed the slightly reduced field of vision. Currently, the PAPR constitutes approximately 50 percent of the respirator usage at TMI-2.

It is recognized that the PAPR study referenced above is qualitative in nature. Currently under evaluation is the need for conducting controlled experiments to quantify changes in worker efficiency associated with use of the PAPR.

The surface contamination levels inside the TMI-2 Reactor Building justify use of protective clothing including cotton coveralls and disposable plastic outer garments. By July 1984, a large capacity air conditioning system will be operational inside the Reactor Building. This system should reduce ambient temperature and humidity thereby making work less stressful. As the air conditioning system is used, efforts will be undertaken to determine to what extent the use of protective clothing can be reduced.