For: The Commissioners

From: Saul Levine, Director
Office of Nuclear Regulatory Research

Thru: Executive Director for Operations

Subject: DEVELOPMENT AND IMPLEMENTATION OF A PLAN FOR POST-ACCIDENT EXAMINATIONS OF TMI-2

Purpose: Approval of a letter from Chairman Hendrie to DOE's Mr. John Deutch

Discussion: The TMI-2 plant has the potential for providing a great amount of safety related data prior to its decontamination and requalification. Careful attention should be given to obtaining this information during the recovery operations. Meetings have been held among DOE, NRC, EPRI, and GPU to discuss the types of recovery operations necessary, the associated data which would be valuable to obtain and the management/coordination structure to ensure adequate planning and implementation of such operations.

The enclosed proposed letter to DOE requests cooperation from DOE in participating in this endeavor and in providing funding needed for data recovery. DOE has indicated its willingness to fund portions of the research efforts required to obtain the desired data and wishes stated support from NRC. Representatives of the NRC Staff and of NRC Contractors are prepared to work with DOE, EPRI and others to form a technical plan for the needed research. The attachment to the enclosed letter contains a preliminary listing of safety related categories and types of desired data to indicate NRC's thinking in this area. Of course, this list will be modified as detailed planning proceeds.

While it is anticipated that DOE would fund most of the work, small efforts are expected by EPRI and NRC to obtain information directly related to programs currently underway.

Coordination: This has been concurred in by the Offices of Nuclear Reactor Regulation, and Executive Legal Director.

Saul Levine

Saul Levine, Director
Office of Nuclear Regulatory Research

Enclosures:
1. Proposed letter to Mr. Deutch
2. "Example Paper" for TMI-2 Recovery Examinations

NOTE: Commissioners' comments are requested by c.o.b. _____
Contact:
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICE OF THE
CHAIRMAN

Mr. John M. Deutch
Acting Under Secretary
U. S. Department of Energy
Washington, D.C. 20545

Dear Mr. Deutch:

I am writing you concerning the need for developing and implementing a plan for the post-accident examination of the Three Mile Island Unit 2 (TMI-2) power station. The accident was a highly regrettable occurrence, but the information that can be derived from a careful examination of the facility before and during clean-up can be invaluable in providing both understanding of the accident and reactor safety information.

Several discussions have been held on this subject. At a meeting of senior staff representatives of DOE, EPRI, GPU, and NRC, it was concluded that it would be useful to develop a coordinated program under the aegis of a Joint Coordinating Committee. I support this approach and recommend that DOE give strong consideration to the allocation of funds and other resources for this effort.

Some areas in which such information can be obtained are:

(a) fission product behavior, transport, and plateout;

(b) the extent and location of core damage from thermal and chemical degradation;

(c) other primary system structural damage, if any;

(d) damage and deterioration of equipment in the containment.

Such information is not only valuable to the missions of the NRC and DOE, but will be equally valuable to the international community. The enclosure hereto contains a more detailed preliminary listing of data needs.

In essence, TMI-2 can provide a large amount of information which might not be available from limited scale experiments or simulations. It is important that these data not be lost in the recovery of the facility. Your attention to this matter is appreciated.

Sincerely,

Joseph M. Hendrie
Chairman

Safety Related Examinations During TMI Recovery Operations

The TMI-2 plant, in its present accident aftermath state, contains a wealth of information of potentially great value to the NRC for understanding the nature of accident initiated effects on plant, equipment, and fluids. To guide future activities in preventing and mitigating the effects of accidents and to identify sources of potential decontamination and requalification difficulties it is of great importance that careful attention be given during recovery operations to obtaining data which could otherwise be forever lost without adequate planning and control. An early objective should be to determine and compare the values of alternative data needs and to establish their relative priorities prior to the various recovery operation steps during which they would take place.

A preliminary listing of desired information examples by category is given as follows for early planning purposes (taken from a more extensive list compiled from all sources within NRC staff):

Listing of Data Interests for TMI Recovery Examinations

General Guidelines

1. The recovery plan should be integrated with safety related examinations to minimize the loss of valuable information. A management mechanism has been suggested to assure proper coordination.

2. Provision should be made for careful recording and filing of photographs, TV tapes, voice records, etc. made during the recovery process.

3. Provision should be made for library samples for possible future tests.

Examples of Specific Examinations

A. Containment Building Interior Prior to Start of Decontamination

1. The disposition of radionuclides on walls and operating floors, and adsorption on concrete, should be sampled by swipes, trepanning or similar techniques.

2. Examination for damage associated with hydrogen burn.

3. All glass light bulbs and glass covers should be collected, identified for specific location and saved for eventual analysis. These items could provide an excellent indication of integrated dose to various parts of the containment since it is known that the amount of darkening (or change in optical density) is related to dose.

4. Check operating floor areas for any evidence that the containment spray was limited in lateral extent.

5. Assess debris in sump to determine type, size, and initial and final location if (and how) clogging took place.

B. Tests after Decontamination of Containment Building

1. Perform a detailed examination of safety grade electrical equipment including cables, instruments, and motors.

2. Check condition of thermal insulation.

3. Check condition of valves, blowdown lines, valve packing and gaskets.

4. Determine extent of external corrosion on reactor pressure vessel (including head), steam generators, pressurizer, piping and carbon steel valves inside containment.

5. Identify radionuclides and their location within the damaged steam generator.

6. Perform containment leak rate test to ascertain containment integrity subsequent to hydrogen explosion and intense radiation exposure.

C. Core and Reactor Vessel

1. Reactor Vessel, CRDM's, etc. (External)

   a. extent and location of sites of contamination; characterization of radionuclides present,

   b. examination for signs of overheating, thermal distortions.

2. Reactor Vessel, CRDM's, Instruments (Internal)

   a. melting, distortion, fission product entrapment, etc., effects on control systems, thermal shields, upper and lower core support structures,

   b. examination of vessel interior for damage and for signs of various accident conditions.

3. A visual examination of the core geometry with appropriate photographs; precise axial and radial locations of abnormalities.

4. Determination of extent of gross assembly-to-assembly core damage/ distortion; estimation of flow blockages or other hydraulic phenomena, and distribution of thermal effects.

5. Determine distribution of (fuel and clad) debris and formation and composition of debris deposits and debris beds.

6. Assessment of the conditions of core instrumentation prior to removal.

7. Removal and inspection of fuel bundles to determine if ruptured or melted.

8. Poolside examination of any intact fuel bundles for degree of ballooning and flow restriction.

9. Removal and examinations of portions of guide tubes, control rods, instrumentation tubes, and upper and lower core structural components.

10. Removal of small samples from selected regions of the core.

11. Hot cell examination of samples for:

    a. an estimate of the maximum clad and fuel temperatures reached in different portions of the core,

    b. extent of oxidation of cladding in different temperature zones,

    c. extent of damage to grids spacers,

    d. evidence of UO_2 melting,

    e. evidence of Zr/UO_2 liquid phase formation,

    f. evidence of hydriding of zirconium cladding and the extent of hydride formation,

    g. structural integrity of fuel pins as a function of temperatures reached,

    h. geometry of damaged fuel to assist estimates of coolability.

D. Survey Auxiliary Building and Contents

1. Radionuclide deposition

2. Flooding damage

3. Contamination of steam relief valves, lines and let-down heat exchangers.

E. Primary Coolant

1. Coolant before and during decontamination to provide archival samples for analysis. (It may be desirable to interupt decontamination to dissolve lanthanides to obtain a sample of their abundance.)