

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 77-20

Docket No. 50-289

License No. DPR-50 Priority --- Category C

Licensee: Metropolitan Edison Company

P. O. Box 542

Reading, Pennsylvania 19603

Facility Name: Three Mile Island I

Inspection at: Middletown, Pennsylvania

Inspection conducted: June 13-15 and 20 & 21, 1977

Inspectors: Karl E. Plumlee 7/22/77  
Karl E. Plumlee, Radiation Specialist, FF&MS Branch date signed

Robert O. McClintock 7/22/77  
Robert O. McClintock, Chief, Materials Radiological Protection Section, FF&MS Branch date signed

Karl E. Plumlee, for 7/22/77  
Ronald L. Nimitz, Radiation Specialist (Co-op), FF&MS Branch date signed

Charles O. Gallina 7/22/77  
Dr. Charles O. Gallina, Investigation Specialist date signed

Approved by: Peter J. Knapp 7/22/77  
Peter J. Knapp, Chief, Radiation Support Section FF&MS Branch date signed

Inspection Summary:

Inspection on June 13-15 and 20-21, 1977 (Report No. 50-289/77-20)

Areas Inspected: Special, announced inspection of radioactive liquid waste solidification, packaging and shipping following a telephone notification of waste container leakage that occurred on June 13 and 14, 1977, during transport of TMI waste (intended delivery to Sheffield, Illinois burial site-turned back in the Clinton county, Pa. area). The inspection involved 43 inspector-hours on-site by four NRC inspectors. Upon arrival, areas where work was being conducted were examined to review radiation safety control procedures and practices.

Results: Of the three areas inspected three apparent items of noncompliance were identified (infractions-failure to adhere to four areas of procedures, and lack of procedures-Paragraph 8; failure to label containers of radioactive material-Paragraph 9.b; and failure to post a high radiation area-Paragraph 9.a)

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## DETAILS

### 1. Persons Contacted

#### a. Metropolitan Edison Company Personnel

\*W. Cotter, Supervisor of Quality Assurance  
\*R. Dubiel, Supervisor of Radiation Protection and Chemistry  
E. Fuhrer, Operations Engineer  
R. Klingaman, Manager, Generation and Engineering  
\*G. Kunder, Supervisor of Operations, Unit I  
R. McCann, Radiation Protection Foreman  
\*G. Miller, Site Superintendent  
J. O'Hanlon, Unit I Superintendent  
J. Smith, Foreman, Rad-Waste Operation  
P. Velez, Radiation Protection Foreman

#### b. State of Pennsylvania Personnel

T. Gerusky, Director, Pennsylvania Bureau of Radiological Health (PBRH); and member, Hazardous Substance Transportation Board (HSTB)  
J. Shaw, Executive Secretary, HSTB  
L. West, Investigator, HSTB

#### c. Other Personnel

G. Costomiris, Gilbert Associates  
D. Ferrigno, Gilbert Associates  
K. Gablin, Vice President, Protective Packaging, Incorporated

\*denotes those contacted during the exit interview, conducted by telephone on June 16, 1977.

### 2. Licensee Description of Shipment Leakage

The licensee representative stated that radioactive waste shipment no. 77-60 departed the TMI site at 3:25 P. M. on June 13, 1977, and these events followed:

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- a. The vehicle traveled northbound on Pa. Route 441, Interstate Route 83 and 283, Pa. Route 15, and westbound on Interstate Route 80 to a highway rest area in Clinton County, Pa. (site 34 between exits 28 and 29). The total highway travel was 90 miles to this point.
- b. The driver made a routine check of the vehicle and tires and found a drip of liquid from the trailer transporting the eight waste containers, at 7:30 P. M. The shipment did not proceed further.
- c. The driver contacted various individuals by telephone including the TRISTATE Motor Transit dispatcher at Joplin, Mo. and the TMI shift supervisor, by 8:06 P. M.
- d. The TMI representatives organized a team to check the shipment and notified the Director of the PBRH by 8:40 P. M. and the NRC R:I duty officer by 9 P. M.
- e. The Director of PBRH arrived at the Rest Area before 11:15 P. M. and the TMI team departed from the Harrisburg area at 9 P. M., and arrived at the Rest Area at 11:15 P. M. on June 13, 1977.
- f. After taking precautions to preclude any additional leakage, and having decontaminated the point where water had dripped on the paving at the rest area, there was concurrence that the shipment, should be returned to TMI. The rest area pavement was wet over less than a one square foot area; and there was no removable contamination; the radiation level at contact was 0.16 mrem/hr as left. Barricades erected by the Highway Patrol were then removed. (The inspector noted that the rest area is the responsibility of Pennsylvania authorities and that the condition as left appeared to be within the acceptable limits stated in Table I of Regulatory Guide 1.86 for release of an area to unrestricted use.
- g. The transport vehicle departed the rest area at 15 minutes before 1 A. M. on June 14, 1977, and arrived at the TMI site at 3:50 A. M. Several checks for any recurrence of leakage were made enroute.

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- h. The licensee representative stated to the inspector that a quart of liquid had leaked from container no. 77-C-58 into the trailer when he checked the shipment at 11:15 P. M. on June 13, and there did not appear to be any other leak.
- i. A subsequent sample and analysis of liquid leaking from container no. 77-C-58 is described in Paragraph 5. Based on this information it appears that a quart of liquid contained 105 microcuries of radioactivity and at least that amount had leaked into the transport trailer and a detectible amount dripped on the Rest Area pavement.

3. Observation of Decontamination Results, Return Shipment, and Offloading of Shipment

- a. After the transport vehicle started the return trip, inspectors surveyed the point in the rest area where the transport vehicle had stopped.

The inspectors found that the release of this area for unrestricted use appeared to be acceptable as described in Paragraph 2.f.

- b. An inspector subsequently interviewed the Director of the PBRH and the Director stated that a gallon of liquid appeared to have leaked into the trailer when he checked it at the rest area, and a small area under the trailer was wet which he described as one square foot in area.

Subsequent observation by an inspector on June 15 during offloading indicated that at that time in excess of a gallon of liquid had leaked into the trailer, however four containers appeared to leak on June 15. (Tape had been applied over the leak in container no. 77-C-58 to prevent leakage, before leaving the rest area.)

- c. Inspectors followed the return of the shipment and observed, when the transport vehicle reached the TMI site at 3:50 A. M. on June 14, 1977, that there appeared to have been no recurrence of dripping, that the protective covering on the trailer appeared not to be disturbed, and that the licensee secured the vehicle on arrival at the TMI site.

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- d. Later on June 14, the licensee placed the transport trailer containing shipment no. 77-60 indoors at the fuel handling building loading dock and the shipment was offloaded on June 15. The inspector observed that smears were taken of four leak areas on four different containers during offloading and the reported removable contamination was 30,000 to 93,000 DPM on these smears.
- e. Smears of the dry underside of the trailer and the spare tire, which was cradled under the trailer were reported to be >13,000 DPM on June 14. The licensee representative stated that the trailer will be decontaminated before it is returned to highway use.

4. Observation of Draining of Containers on June 20 and 21, 1977

An inspector also witnessed the draining of each of the eight containers of shipment no. 77-60 on June 20 and 21 and the following amounts of liquid were drained from these containers, which had been shipped as containers of solidified waste. The licensee representative stated that each container had been drained at least two times over a period of two or three months prior to June 13, 1977, and that each was drained again before being loaded for transport offsite. There were no records of the amounts drained on any previous efforts to drain these particular containers, however, the oral statement was that up to 60 gallons had been collected where a given container was drained several times over a three month period.

| <u>Container No.</u> | <u>Manufacturer's Serial No.</u> | <u>Volume Drained(L)</u> | <u>Liquid pH</u> | <u>Comments (see below)</u> |
|----------------------|----------------------------------|--------------------------|------------------|-----------------------------|
| 77-C-51              | 1164 DF                          | 48 1/2                   | 1.2              | A                           |
| 77-C-52              | 3022 DF                          | none                     | NA               | B                           |
| 77-C-57              | 3025 DF                          | 46 1/2                   | 0.95             | B,C                         |
| 77-C-58              | 306 DF                           | 11                       | 1.08             | B                           |
| 77-C-63              | 1153 DF                          | 1/2                      | Not measured     | A                           |
| 77-C-64              | 305 DF                           | 7                        | 1.33             | A                           |
| 77-C-65              | 3010 DF                          | 8                        | 1.18             | A                           |
| 77-C-66              | 3012 DF                          | 12                       | 4.63             | B,C                         |

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- Comments:
- A - these containers did not appear to leak at any time during the inspection.
  - B - these containers appeared to leak (observed June 13, when this shipment was found to drip, or during offloading on June 15, 1977.
  - C - these containers appeared to have been patched prior to June 13, 1977 and the licensee representative stated that these patches were over leaks known prior to June 13 (Container no. 77-C-57 appeared to leak at a patch).

Based on the above information at least 69 1/2 liters (about 18 gallons) of liquid appeared to be present in three containers that leaked and at least 64 liters appeared to be present in the four containers that did not leak. Container no. 77-C-52 appeared to leak at a point 2-in. above the bottom but efforts to drain the container did not draw off any liquid.

5. Activity of Liquid Leaked from Container No. 77-C-58

On June 14, 1977, a licensee representative obtained a 25 ml sample of liquid that leaked from container no. 77-C-58 and obtained the following analysis.

| <u>Nuclide</u> | <u>Activity (uCi/ml)</u> | <u>+or-Sigma</u> |
|----------------|--------------------------|------------------|
| Mn-54          | 5.90E-4                  | 9.3E-5           |
| Co-58          | 1.03E-2                  | 1.3E-3           |
| Co-60          | 1.06E-3                  | 1.6E-4           |
| Xe-133         | 4.91E-3                  | 6.4E-4           |
| Cs-134         | 4.91E-2                  | 4.6E-3           |
| Cs-137         | 5.38E-2                  | 6.6E-3           |
| <u>Total</u>   | <u>1.1E-1</u>            |                  |

Assuming that a quart (0.95 L) leaked into the trailer (Paragraph 2.h), this liquid appears to have contained 105 uCi (+ 8% std dev.) of radioactivity that was released into the trailer.

6. Quantities & Radiation Levels of the Shipment and Individual Containers

The following information was obtained from shipping records.

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a. Contents of shipment no. 77-60 (bill of lading dated June 13, 1977):

Number of Containers - 8  
 Volume @ 50 cu. ft. ea. - 400  
 Net weight of 8 containers - 25,000 lbs  
 Total contained activity - 4,698.23 millicuries

b. Contents of individual containers (two survey records dated June 8, 1977-part of shipping papers):

| <u>Container No.</u> | <u>Physical State</u> | <u>mrem/hr at surface</u> | <u>mrem/hr at 3 ft.</u> | <u>quantity (millicuries)</u> |
|----------------------|-----------------------|---------------------------|-------------------------|-------------------------------|
| 77-C-51              | Solid                 | 150                       | 45                      | 242.74                        |
| 77-C-52              | Solid                 | 150                       | 40                      | 242.74                        |
| 77-C-57              | Solid                 | 10                        | 8                       | 190.8                         |
| 77-C-58              | Solid                 | 30                        | 10                      | 190.8                         |
| 77-C-63              | Solid                 | 80                        | 60                      | 9.2                           |
| 77-C-64              | Solid                 | 100                       | 40                      | 1274.                         |
| 77-C-65              | Solid                 | 100                       | 40                      | 1274.                         |
| 77-C-66              | Solid                 | 100                       | 40                      | 1274.                         |

The licensee representative stated that these quantities were calculated from concentrated waste sample analyses and a conservative estimate that 262 gal. (i.e. 75% by vol. or  $10^6$  ml) of concentrated waste was placed in each container for solidification.

7. Quantity of Activity in Liquid Drained from Each Container

It appears that the following quantity of radioactivity was present in liquid drained from each container on June 20, and 21, 1977.

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| <u>Container No.</u> | <u>Liquid Volume(ml)</u> | <u>Concentration*(uCi/ml)</u> | <u>Quantity (millicuries)</u> |
|----------------------|--------------------------|-------------------------------|-------------------------------|
| 77-C-51              | 48,500                   | 0.24                          | 11.64                         |
| 77-C-52              | --                       | 0.24                          | --                            |
| 77-C-57              | 46,500                   | 0.19                          | 8.84                          |
| 77-C-58              | 11,000                   | 0.19                          | 2.09                          |
| 77-C-63              | 500                      | 0.009                         | 0.005                         |
| 77-C-64              | 7,000                    | 1.27                          | 8.89                          |
| 77-C-65              | 8,000                    | 1.27                          | 10.16                         |
| 77-C-66              | 12,000                   | 1.27                          | 15.24                         |

\*Apparent concentration of concentrated waste storage tank liquid transferred into the shipping container.

The inspector noted that the liquid removed from each of six shipping containers apparently contained in excess of a millicurie of radioactivity and could not be considered to be a limited quantity exempt from the requirements of 49 CFR 173.393 (g)(2) & (3) that absorbent material must be provided to absorb at least twice the volume of radioactive liquid contents of containers of liquid radioactive material and that a secondary container must be provided, for a shipment of such materials.

8. Review of the Solidification and Packaging of Shipment No. 77-60

The Technical Specifications in section 6.8 "Procedures" require that written procedures be established and maintained that meet or exceed the requirements and recommendations of Sections 5.1 and 5.3 of ANSI N18.7-1972, subsection 5.3.7 of which requires written procedures for the control and management of radioactive waste.

- a. TMI Administrative Procedure 1003 "Radiation Protection Manual" requires in section 6.3.1.3 that all shipments of radioactive materials will comply with DOT Regulations.
  1. The licensee representative stated to the inspector that it had not been elected to consign shipment no. 77-60 as Low Specific Activity (LSA) radioactive material and the inspector noted that the containers and the vehicle were not marked LSA and the shipping papers did not state that the consignment was LSA material.

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The inspector noted that, since the shipment was not consigned as LSA material it would have been necessary to package in compliance with the requirements of 49 CFR 173.393 (g)(1), (2) and (3) for leak-resistant and corrosion-resistant inner containers, enough absorbent material to absorb twice the volume of radioactive liquid contents, and a secondary containment vessel adequate to prevent loss or dispersal of the radioactive contents under normal conditions of transport. (A different list of requirements apply to LSA shipments).

The licensee's failure to take these required precautions apparently resulted in the release of 105 microcuries of radioactive liquid into the trailer during transport over public highways on June 13, 1977, and a detectible amount of radioactive liquid dripped onto the Rest Area pavement.

2. The inspector noted that to comply with the requirements of 49 CFR 172.100, -172.402, -172.403 (g)(?), and -173.310 (a)(1) and (2) these containers would have been labeled or marked to show the proper shipping name of the hazardous material, the Transport Index, the gross weight of each container, and the words "TYPE A" in letters at least 1/2-inch high, and multiple labeling or marking would have been provided on each container.

The inspector noted that none of these containers was marked "Radioactive LSA" or "Radioactive NOS"; that the six containers having transportation indexes greater than 10 were not marked to show this; that the gross weight was not marked on any container; and that although the words "Type A" were handwritten on the Radioactive Yellow-III labels the information was difficult to find because the letters were less than 1/4-inch high and not 1/2-inch high as required. Two containers did not have multiple Radioactive Yellow-III labels and this appeared to be the result of one of the two labels on each container falling to the floor of the trailer during shipment or offloading.

The inspector noted that the licensee's apparent failure to mark and label those containers in strict compliance with the DOT Regulations could have resulted in errors during transport or at the destination of the shipment. (Other labeling requirements are given in Paragraph 9)

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3. The inspector noted that to comply with the requirements of 49 CFR 173.393(j) specific instructions for maintenance of vehicle exclusive use controls would have been given in the shipping papers for shipment no. 77-60.

The survey record showed that six of the eight waste containers each had a Transportation Index greater than 10 (and the aggregate transport index exceeded 50) but the shipping papers did not specify instructions for maintenance of exclusive use controls by the carrier and this omission could have resulted in errors during the transport of these containers.

- b. Procedure 1104-28 "Solid Radwaste Disposal System-Packaging and Solidification of Solid and Liquid Radwaste" in procedure section 1104-28.2.1.1 requires that the Shift Foreman shall enter instructions for the sampling, analysis and packaging of batches of waste from either the Spent Resin Storage Tank, Used Precoat Tanks or Concentrated Waste Storage Tanks in the "Process Instruction and Data Sheet" prior to the initiation of any transfers from these tanks and that the operator(s) performing these function(s) shall enter all subsequent data concerning sampling, analysis and packaging of a batch of solid waste. Further statements concerning entries and changes to the "Process Instruction and Data Sheet" appear in procedure sections 1104-28.2.1.1, -28.3.1.b, -28.3.2.a and -28.3.4.a and in sections 1104 -29.24.4.2.4, -29.24.4.2.6, and -29.24.4.3.2.

The licensee representative stated that no "Process Instruction and Data Sheets" had been prepared prior to, during, or after the transfer of concentrated waste from the concentrated waste storage tanks or in any connection with the packaging of the eight containers of shipment no. 77-60 or any other container of solidified concentrated waste processed up to that date (June 14, 1977).

The inspector stated that the transfer and packaging of radwaste without the required instructions prior to these operations, and the failure to maintain the required records of the sampling, analysis and packaging were apparent instances of noncompliance with the above procedures which could result in errors in the solidification, packaging and shipping of radwaste as well as failures to identify any errors.

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- c. Procedure section 1104-28.3.1.a requires that the Supervisor of Operations, or his designee designates on the applicable data log that a sufficient amount of radwaste has accumulated in a specified tank to warrant initiation of the packaging operation.

The licensee representative stated that no such data log was maintained.

The inspector stated that the failure to log the required information was an item of apparent noncompliance with the above procedure which could have resulted in errors in radwaste operations.

- d. Adherence to Radiation Work Permit (RWP): The licensee "Radiation Protection Manual" in section AP 1003-2.10 "Radiation Work Permit" requires enforcement of all the radiation controls and adherence to the instructions listed on the Radiation Work Permit, and states that Radiation Work Permits are required for all work or entry in areas that could cause exposure in excess of 5 mrem/hr or greater than 2200 DPM/100 cm<sup>2</sup> Beta-Gamma.

During the inspector's observation of the draining of shipping containers on June 21, 1977, at 2 P. M., in the area described in Paragraph 9 which was at that time posted as a High Radiation Area and a Contaminated Area and contained areas accessible to personnel wherein exposure was possible up to 150 mr/hr and 50,000 DPM/100 cm<sup>2</sup> of removable Beta-Gamma contamination, the inspector observed that an individual entered (who had crossed two ropes bearing the above signs) without the survey instrument, shoe covers, and gloves required by the applicable RWP (no. 1192-standing RWP for routine entries).

The inspector identified this as an apparent item of noncompliance with the above requirements, which could cause unnecessary exposure to the individual involved.

- e. Procedures for Draining and Patching of Solidified Radwaste Containers: the licensee representative stated that no record was available for inspection that individually identified any of the containers composing shipment no. 77-60 as having been drained; that there were no written approved procedures for draining these containers before June 14, 1977; and that there were no written approved procedures for patching containers that leaked, prior to that date.

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The inspector observed that the Rad-Waste Operations Foreman's logbook contained entries indicating that work had been done but did not identify the individual containers involved or any criteria by which the work was accepted.

The inspector identified the lack of written approved procedures for draining and patching of these solidified radwaste containers as an apparent item of noncompliance with the requirements of Technical Specifications section 6.8.1, which could result in errors in draining containers and in repairing containers that were known to leak.

9. Posting of a High Radiation Area and Labeling of Solidified Radioactive Waste Containers

After observation of the completion of the offloading of shipment no. 77-60 prior to 3:00 P. M. on June 15, 1977, the inspector requested the licensee representative to arrange for a tour of the room in the Auxiliary Building where these eight containers had been stored as these were offloaded. This room was at a lower level than the loading dock.

- a. Posting: On entering this room, after 4:00 P. M., the inspector requested the licensee representative to show him the "High Radiation Area" posting for the area. The sign was then found facing a wall, and the licensee representative stated that the stand and rope supporting the sign had been moved out of the way earlier in the day to clear the entrance to the room for passage of the forklift used to store the eight containers of waste shipment no. 77-60, and apparently the sign was overlooked at the completion of that job. The inspector observed that a rope and a "Radioactive Material Area" and "Contaminated Area" sign had been placed across an outer area, but no "High Radiation Area" sign was visible and the area had apparently been only intermittently attended during offloading (most of the dayshift) and had been unattended between 3:00 P. M. and 4:00 P. M. on June 15, 1977. The inspector requested the licensee representative to survey the area, and the licensee's measurements indicated 150 mr/hr at 12-inches distance from each of two solidified waste containers that were not part of shipment no. 77-60 and had not been moved either during the day or following a previous survey known to a licensee representative.

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The inspector identified the failure to conspicuously post this high radiation area as an item of noncompliance with the requirement of 10 CFR 20.203(c)(1) which could cause an unnecessary exposure to personnel. (77-20-02)

- b. Labeling: The inspector noted that neither of these two containers were labeled as "Radioactive Material" or otherwise individually identified as radioactive by any visible sign or posted record. The inspector noted that the entrance of the anteroom was posted at a distance of 40 feet from these containers, as described above.

The inspector identified the failure to label each of these two containers with a clearly visible label identifying the radioactive contents as an item of noncompliance with the labeling requirement of 10 CFR 20.203(f) "Containers", which could cause an error in managing these containers. (77-20-03)

10. Exit Interview

The inspector reviewed the scope and the findings of the inspection with the licensee representatives by telephone on June 16, 1977, as indicated in Paragraph 1.

The inspector identified the examples of failure to adhere to procedures and the lack of procedures, described in Paragraph 8, as an item of noncompliance with the requirements of Technical Specifications Section 6.8 "Procedures" (77-20-01); and the failures to post a high radiation area and to label containers, described in paragraph 9, as items of noncompliance with 10 CFR 20.203(c) and (f). (77-20-02 and 77-20-03).

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