RELATED CORRESPONDENCE

DOCKETED
USNRC
SEP 19 1980
Office of the Secretary
Docketing & Service
Branch

Lic 9/15/80

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear Station, Unit No. 1)	)	
	)	

LICENSEE'S TESTIMONY OF

EDWIN C. FUHRER AND RICHARD J. MCGOEY

ON THE PHYSICAL SEPARATION OF

THREE MILE ISLAND UNITS 1 AND 2

8009260443

Outline

This testimony deals with the physical separation of Three Mile Island Units 1 and 2. It addresses short-term action items 4 and 5 from the Commission's August 9, 1979 "Order and Notice of Hearing," Board Question 8, CEA Contention No. 5, and the issues raised by those intervenor contentions which when initially drafted related to short-term action items 4 and 5, but which subsequently either have been withdrawn or dismissed.

The testimony is organized into five major sections. Each section is summarized below:

Section 1 -- Unit 1 Waste Handling Capability. The TMI-1 liquid radwaste processing systems, the waste gas systems and the solid waste systems are described. An analysis is presented which demonstrates that these systems are adequate to safely contain, store and process anticipated waste streams during both normal and postulated accident conditions. The testimony also demonstrates that TMI-1 will not rely on liquid or gaseous waste storage at Unit 2.

Section 2 -- Unit 2 Waste Handling Capability. The TMI-2 liquid radwaste processing systems, the waste gas systems and the solid waste systems are described. This description includes a discussion of the changes made to the waste handling systems since the March 28, 1979 accident, and outlines current views as to the system changes that will be necessary to complete cleanup of Unit 2. An analysis is presented which demonstrates that these systems are adequate for their intended purposes and that Unit 2 will not have to rely on Unit 1 waste handling facilities.

Section 3 -- Separation and Isolation of Unit 1 and 2 Facilities. Common facilities and interconnections between Units 1 and 2 that have a potential for permitting the movement of contaminated fluids (either liquid or gaseous) from one unit to the other are described. The means for isolating these interconnections also are described. Included is a discussion of Unit 1 and 2 monitoring systems which demonstrates the ability to discriminate between effluents resulting from each unit.

Section 4 -- Decontamination and Restoration at Unit 2 and its Effect on Operations at Unit 1. The current status of the Unit 2 reactor is described. An outline of the steps taken and to be taken for Unit 2 cleanup is presented. The relationship between Licensee cleanup activities at Unit 2 and NRC involvement in these activities is described. An analysis of potential hazards and consequences, with respect to both Unit 2 reactor cooling and cleanup activities, is presented. The purpose of this discussion is to demonstrate that future cleanup activities will be carefully planned, reviewed and implemented so as not to affect adversely the safe operation of Unit 1.

Section 5 -- CEA Contention No. 5. The contention is set forth and a specific response is provided. To the extent possible, this response draws on the material provided in the first four sections of the testimony. In particular, the conclusions to be drawn from the earlier testimony, and their relationship to CEA Contention No. 5, are presented.

Index

INTRODUCTION

This testimony by Mr. Edwin C. Fuhrer, Radwaste Supervisor at TMI-1, and Mr. Richard J. McGoey, Manager Process Support at TMI-2, addresses the physical separation of Three Mile Island ("TMI") Units 1 and 2.

In its August 9, 1979 "Order and Notice of Hearing," the Nuclear Regulatory Commission found that "unique circumstances at TMI require that additional safety concerns identified by the NRC staff [beyond those identified for other B&W reactors] be resolved prior to restart" (p. 4). Among those concerns were the "potential interaction between Unit 1 and the damaged Unit 2" and the "potential effect of operations necessary to decontaminate the Unit 2 facility on Unit 1" (pp. 4-5). In order to satisfy its concerns in these areas, the Commission directed Licensee to undertake certain "short-term actions." With respect to the physical separation of Units 1 and 2, these short-term actions are as follows:

> 4. The licensee shall demonstrate that decontamination and/or restoration operations at TMI-2 will not affect safe operations at TMI-1. The licensee shall provide separation and/or isolation of TMI 1/2 radioactive liquid transfer lines, fuel handling areas, ventilation systems, and sampling lines. Effluent monitoring instruments shall have the capability of discriminating between effluents resulting from Unit 1 or Unit 2 operations (p. 6).

5. The Licensee shall demonstrate that the waste management capability, including storage and processing, for solid, liquid, and gaseous wastes is adequate to assure safe operation of TMI-1, and that TMI-1 waste handling capability is not relied on by operations at TMI-2 (pp. 6-7).

The purpose of this testimony is to present and summarize the steps taken by Licensee to satisfy these short-term action items. This testimony also addresses Board Question 8 and the issues raised by those intervenor contentions which when initially drafted related to short-term action items 4 and 5, but which subsequently either have been withdrawn or dismissed. In addition, as directed by the Board's "Memorandum and Order of Prehearing Conference of August 12-13 1980," at page 10, this testimony responds specifically to Chesapeake Energy Alliance ("CEA") Contention No. 5.

Much of the material presented in this testimony is taken from Chapter 7 of Licensee's "Report in Response to NRC Staff Recommended Requirements for Restart of Three Mile Island Nuclear Station Unit 1" (hereinafter cited as "Restart Report") and from Chapters C4 and C5 of the Staff's "Evaluation of Licensee's Compliance with the Short- and Long-Term Items of Section II of the NRC Order dated August 9, 1979" (hereinafter cited as "Staff SER").

BY WITNESS FUHRER:

SECTION 1 -- UNIT 1 WASTE HANDLING CAPABILITY

Unit 1 systems are provided for the holdup and/or processing of liquid, gaseous and solid radwaste. Each of these systems is discussed below.

A. Liquid Radwaste Processing

There are two subsystems for the processing of radioactive liquid wastes at TMI-1. The primary coolant chain (reactor coolant liquid radwaste subsystem) processes reactor grade water, including letdown and leakage from the primary system, spent fuel pool water, and water being recycled through the decay heat removal system. This subsystem consists primarily of collection tanks, pumps, coolers, precoat filters, demineralizers, and an evaporator. Table 1 summarizes the equipment included in the primary coolant chain. The miscellaneous waste chain (miscellaneous liquid radwaste subsystem) processes wastes produced within the auxiliary and fuel handling buildings resulting from the processing of reactor, spent fuel pool and secondary system liquids, and wastes resulting from sampling, decontamination and personnel showers. This subsystem consists primarily of collection tanks, pumps, demineralizers, an evaporator, and floor and equipment drains with associated sumps. Table 2 summarizes the equipment included in the miscellaneous waste chain. Table 3 summarizes equipment common to both chains.

Controls permit the operator to select tanks, demineralizers, pumps and a process piping route as required for the function to be performed. A duplication of tanks, pumps and process equipment in areas of high service allows operations to proceed normally in the event some equipment is unavoidably out of service for an extended period. Numerous cross connects between storage tanks and alternate process paths provide emergency or additional storage capability and flexibility of treatment for the various waste streams. It is also possible to recycle the concentrated or purified effluents produced during waste processing in order to satisfy radioactive waste treatment standards.

The storage tank capacities and process flow rates were conservatively chosen. This is evidenced by the fact that when Unit 2 began operations, capacity in the Unit 1 liquid radwaste system was used to process miscellaneous radwastes generated at Unit 2. Thus, physical separation of the two units (see Section 3 below) will increase the Unit 1 liquid radwaste capability relative to that available during the preaccident period.

Based on information provided in the TMI-1 Final Safety Analysis Report ("FSAR"), the Restart Report, and Licensee's 10 C.F.R. Part 50, Appendix I submittals of June 4, 1976, the NRC Staff has made an independent analysis of the capability of the Unit 1 liquid radwaste system: (1) to reduce and maintain releases of radioactive materials in liquid effluents to "as low as is reasonably achievable;" (2) to maintain releases below the limits specified in 10 C.F.R. Part 20, Appendix B, Table II, Column 2; (3) to meet the dose design objectives of Section II.A of Appendix I, 10 C.F.R. Part 50; and (4) to meet the cost benefit objectives set forth in Section II.D. of Appendix I, 10 C.F.R. Part 50. The NRC Staff has found that each of these criterion are satisfied by the Unit 1 liquid radwaste system. Staff SER at C5-1 through C5-6.

These evaluations are based on the ability of the system to meet processing demands during normal plant operation and anticipated operational occurrences. In addition, analyses included in the TMI-1 FSAR evaluate the capability of the liquid radwaste system to handle a specified range of postulated accident scenarios. None of these scenarios assume the generation of large quantities of liquid waste -- as, for example, was true during the Unit 2 accident.

However, the Unit 1 liquid radwaste systems, including storage capacity, are adequate to safely contain such large quantities of liquid wastes. The Unit 1 reactor building can safely contain the maximum volume of water available from post-accident Unit 1 sources during an accident. As part of the plant modifications being made by Licensee to Unit 1, various instruments previously located at low elevations in the reactor building are being relocated to higher elevations above the predicted maximum flooded level. This will decrease the likelihood that such instrumentation will be flooded in the event it is necessary to contain large volumes of liquids in the Unit 1 reactor building. The volume of the reactor building available to contain liquids before affecting instrumentation would be approximately 500,000 gallons.

In addition, release of water from the Unit 1 reactor building sump is by gravity and is controlled by two manually activated valves in series, not by automatically started pumps as in Unit 2. Thus, there is less likelihood at Unit 1 that substantial quantities of liquid radwaste will be inadvertently transferred from the reactor building to tankage in the auxiliary building. In the event such transfer is desired, the liquid waste tankage in Unit 1 is similar to that available in Unit 2 at the time of the accident. And, had tankage at Unit 1 not been available during the accident, the Unit 2 accident water could have been retained solely within Unit 2. Conversely, should an accident occur at Unit 1, there would be no reliance on tankage at Unit 2 for liquid storage.

B. <u>Waste Gas Systems</u>

There are three installed subsystems for the collection, hold-up, filtration and monitoring of radioactive gases at TMI-1.

The waste gas disposal system is used for the accumulation, storage and reuse or controlled disposal of high activity level gases evolved from the primary coolant in various systems within Unit 1. The system consists of a low-pressure vent header (including a waste gas delay tank and the gas spaces of seven tanks storing reactor coolant), two gas compressors, three waste gas decay tanks, and a high efficiency particulate air (HEPA) filter. At the 80 psig storage pressure, the decay tanks can store the equivalent of over 15,000 cubic feet of gas at atmospheric pressure.

The auxiliary and fuel handling building ventilation system and the reactor building purge ventilation system are capable of filtering, monitoring and disposing of small quantities of radioactive gases released to the atmosphere of those buildings. This is accomplished by passing air through HEPA filters and charcoal adsorbers prior to release. In this manner radioactive particulates and iodine can be removed.

During the preaccident period, the Unit 1 auxiliary and fuel handling buildings utilized a common ventilation system. Because the Unit 1 and 2 fuel handling buildings have a large common air space that would be difficult to separate, a physical barrier will be installed to separate the Unit 1 auxiliary building from the Unit 1 fuel handling building. Ventilation system changes, including the installation of separate filtration units, will be made to eliminate the communication of air from unit to unit.

Similar to the analysis with respect to the Unit 1 liquid radwaste system, the NRC Staff also has made an independent analysis of the capability of the Unit 1 waste gas system: (1) to reduce and maintain releases of radioactive materials in gaseous effluents to "as low as is reasonably achievable;" (2) to maintain releases below the limits specified in 10 C.F.R. Part 20, Appendix B, Table II, Column 1; (3) to meet the dose design objectives of Sections II.B and II.C. of Appendix I, 10 C.F.R. Part 50; and (4) to meet the cost benefit objectives set forth in Section II.D of Appendix I, 10 C.F.R. Part 50. The NRC Staff has found that each of these criterion are satisfied by the Unit 1 waste gas system. Staff SER at C5-1 through C5-6.

Projections as to the adequacy of the gaseous effluent cleanup system have been confirmed by Licensee's semi-annual effluent reports to the Commission. These reports show actual releases to the environment to be in compliance with the requirements of 10 C.F.R. Part 20 and Part 50, Appendix I, and to be lower than the limits set by the Technical Specifications, which were based on the projections in the FSAR and the Environmental Report ("ER"). Problems in the Unit 2 waste gas system which came to light in the course of the accident were not related to the design of the system. That such problems will not be encountered in the Unit 1 system is being assured by an extensive program of leak testing, efficiency testing, chemical analyses and operability demonstrations to assure that each component, alone and as part of the system, will perform its intended function if and when called on to do so. Subsequent periodic retesting will be performed in accordance with the program described in Section 2.1.1.8 of the Restart Report.

C. Solid Radwaste Treatment System

Five types of waste are produced, processed and shipped from TMI-1 as solid radioactive waste. These are: (1) concentrated liquid waste (evaporator bottoms); (2) used filter precoat material (spent powdered resin); (3) spent resin (bead type); (4) dry compactible trash; and (5) dry noncompactible trash.

Dry trash is shipped offsite without solidification. Where possible, the trash is first compacted to reduce volume. A trash compactor for use with 55-gallon drums is dedicated to the use of Unit 1.

The concentrated liquid waste, used precoat and spent resin will be solidified prior to being shipped offsite for disposal in those cases where solidification is required by the Unit 1 Technical Specifications or applicable regulations. Permanently installed plant equipment does not now exist to solidify radwaste. As explained below, a two-part program has been initiated to solidify these wastes when required.

In the short-term, until a permanent system is available, Licensee intends to use a mobile solidification system. This system currently is in use at other operating nuclear power plants. The in-cask solidification system uses cement to solidify the wastes in a preshielded container. A disposable liner with an internal mixer is used as the solidification container. The quantity of waste to be solidified is pumped into the liner. The mixer is started and cement is added. Mixing continues until the mixer motor current increases indicating that the mixture is beginning to "set".

For the long-term, Licensee is undertaking an engineering evaluation, leading to the procurement and installation of a permanent facility. This program is currently projected to take about five years. Due to the uncertainties in present solidification technology and the changing regulatory requirements, selection of a permanent facility prior to restart of Unit 1 would be premature. Other mobile solidification systems will continue to be evaluated as to their efficiency and adequacy of the solidified product to determine the best system for use at Unit 1. Use of a mobile system during the interim is adequate to solidify wastes generated from Unit 1 operation.

All radioactive solid waste from the operation of Unit 1, whether solidified or not, will be packaged and transported to a licensed burial facility in accordance with Department of Transportation ("DOT") and NRC regulations. 49 C.F.R. Parts 171-79 and 10 C.F.R. Parts 20 and 71. A Process Control Program ("PCP"), approved by the NRC, governs operation of the solidification system.

D. Summary

The liquid radwaste systems, waste gas systems and solid waste systems just described are adequate to assure safe operation of Unit 1, in accordance with the requirements of the Commission's short-term action item 5. The next two sections of this testimony describe the Unit 2 waste handling capability and the separation of Unit 1 and 2 facilities. Taken together, these sections will demonstrate that Unit 1 waste handling capability will not be relied on for operations at Unit 2, and that Unit 1 is not dependent on Unit 2 for liquid or gaseous processing or storage.

BY WITNESS MCGOEY:

SECTION 2 -- UNIT 2 WASTE HANDLING CAPABILITY

Unit 2 is provided with systems for handling and controlling liquid, gaseous and solid radioactive wastes. Some of these systems existed at the time of the Unit 2 accident, some have been installed and operated since the accident, and some are under construction or planned. A number of the systems are related to the unique nature of the decontamination operations, others are installed to provide compliance with stringent, and in some cases unique, NRC requirements. A central factor in the design and operation of these facilities is that the Unit 2 decontamination effort not rely on any Unit 1 equipment or systems for the processing of Unit 2 wastes. Suitable equipment has been, or will be, installed at Unit 2 to satisfy this requirement. The several systems are described below.

A. Liquid Radwaste Processing

Prior to March 28, 1979, Unit 2 had a liquid radwaste subsystem for processing reactor grade water (primary coolant chain). Following the accident an evaluation was made of the capability of this subsystem to process the waste water generated during the accident. Due to the high radioisotopic concentrations present in the waste water and the existing shielding design of the subsystem, this option is not considered feasible. Rather, the waste water is being, or will be, processed by liquid waste systems installed since the March 28, 1979 accident.

Miscellaneous radioactive wastes produced in Unit 2 prior to the accident were by design transferred to Unit 1 for processing by the Unit 1 miscellaneous liquid radwaste subsystem. These miscellaneous wastes will now not be pumped to Unit 1. New radwaste systems have been constructed at Unit 2 to process this waste.

There are four main categories of water to be handled during the Unit 2 decontamination process: (1) accident-related water; (2) water from decontamination operations; (3) miscellaneous leaks; and (4) decontaminated (cleaned up) water. Two new liquid waste systems already have been installed and successfully operated (the EPICOR I and EPICOR II systems); another system is under construction (the submerged demineralizer system); and, a final system is in the planning stage (the evaporator/solidification facility). Figure 1 provides a general process flowsheet of each of these systems.

EPICOR I has been in operation since April, 1979. This system is used for processing low activity (less than 1.0 uCi/ml) wastes, and is comprised of filter elements, demineralizers, pumps, tanks, piping, and associated instrumentation. Principally, EPICOR I has processed Unit 1 miscellaneous waste waters during the unavailability of one of the Unit 1 evaporators. This system also has processed lesser quantities of Unit 2 nonaccident water. It is not intended that EPICOR I be operated after Unit 1 Restart.

EPICOR II has been in operation since October, 1979. This system is used for processing intermediate activity (1-100 uCi/ml) waste water. It is comprised of filter elements, demineralizers, pumps, tanks, piping and associated instrumentation. EPICOR II has been used to decontaminate all waste waters at Unit 2 except that in the reactor building sump and the reactor coolant system. These wastes include auxiliary and fuel handling building accident water, accumulated system leakage, and water from decontamination operations. The possibility of processing the reactor coolant system water with EPICOR II is in the process of being evaluated. Details related to EPICOR II installation and operation are given in

NUREG-0591, "Environmental Assessment, Use of EPICOR-II at Three Mile Island, Unit 2", October 3, 1979.

The performance of EPICOR II has satisfied its design criterion of reducing radioactivity levels to allow for reuse of the effluent in further decontamination activities, as well as satisfying 10 C.F.R. Part 20 limits for release of liquids. EPICOR II has successfully processed over 501,000 gallons of water. This performance is reflected by data below from the most contaminated source ("C" Reactor Coolant Bleed Tank - Batches 39 to 50):

Radionuclide	Concentration (microcuries per milliliter)	
	Influent	Effluent
Cesium 134	8.3	$5.0x10^{-7}$
Cesium 137	45.9	$2.3x10^{-6}$
Strontium 89	0.4	$2.2x10^{-6}$
Strontium 90	0.27	$4.3x10^{-6}$

The submerged demineralizer system ("SDS") is being installed to handle high activity water -- i.e., water contaminated to greater than 100 uCi/ml, principally the reactor building sump water. The system is expected to provide decontamination factors of 10^6 for cesium, 10^4 for strontium and 10 to 100 for other radionucludes. It is being installed in the Unit 2 spent fuel pool, which will be filled with water following completion of construction. An inorganic ion exchange medium has been selected for removal and retention of the high concentrations of radionuclides, while organic media will remove radionuclides of lower concentrations. The SDS is provided with its own gas cleanup and liquid leak collection systems and utilizes the pool water for shielding. Laboratory tests have shown that this system will yield a product satisfying Commission requirements in 10 C.F.R. Parts 20 and 50 for offsite releases, as well as the "as low as is reasonably achievable" (ALARA) standard. The Commission Staff is reviewing the SDS prior to operation of the system.

The fourth radwaste system, which is an evaporator/ solidification facility, is in the planning stages. It is projected that this system will be used to treat wastes produced from decontamination of surfaces and systems containing high levels of contamination. Should decontamination waste products contain chemicals and/or high concentrations of solid material, this evaporator system may offer processing advantages over EPICOR II or SDS. The need for, and design of, this system is currently undergoing review.

It is anticipated that the four radwaste systems discussed above will suffice to treat all accident and cleanup related water in Unit 2. If ongoing developments indicate the need for any other major system or system modification, review by the Commission will be obtained prior to operation.

Decontaminated water must be stored onsite and not released to the river pursuant to the Commission Order of

February 11, 1980. There existed at the time of the accident over 270,000 gallons of liquid waste holding capacity at Unit 2, much of which is now, should it be necessary, available again for storing contaminated water. Since the accident, tankage for an additional 219,000 gallons of storage has been put in use in connection with the EPICOR II system, and two 500,000 gallon tanks have been erected for the sole purpose of storing decontaminated water in compliance with the Commission order.

Most of the water used in the decontamination operations will be recycled cleaned up water; water from the reactor coolant system will be returned to the reactor coolant system after being processed. Therefore, these waters will not cause an increase in water inventory at Unit 2. It is concluded that the total water storage capacity in Unit 2 of about 1,500,000 gallons is adequate to store the processed water.

B. Waste Gas Systems

In assessing the adequacy of gaseous waste processing at Unit 2 several unique factors need to be considered. First, the short-lived noble gas and iodine radionuclides which contribute over 99 percent of the activity in accident-related releases have decayed away, essentially completely. Also, most of the krypton-85 gas in the reactor building atmosphere has been purged. Second, ongoing activities to decontaminate and cleanup Unit 2 will be primarily wet operations, from which airborne releases are much less likely than from dry operations. Third, there is no stored energy source of appreciable magnitude as with an operating reactor (e.g., high pressure, high temperature, large amounts of fission product decay heat). Therefore, there is no available dispersal force of substance. Fourth, with the reactor shutdown, there is no significant new sources of gas production. Once the existing waste water is degassed, no new source of gas will exist during Unit 2 recovery operations.

It is not planned that any gaseous waste processing equipment not in place prior to the TMI-2 accident will be used during the decontamination operations except those described as parts of the EPICOR II system and the SDS. Gaseous waste release points will be: (1) reactor building purge; (2) auxiliary and fuel handling building ventilation discharge (including SDS sources); and (3) the EPICOR II system.

The preaccident radwaste gas system is used for the accumulation, storage and controlled disposal of gases evolved from primary coolant or radioactive liquid wastes in Unit 2. The system consists of a vent collection header, two gas compressors, two waste gas decay tanks, a HEPA filter, and a charcoal filter. At the 100 psig storage pressure, the decay tanks can accommodate an equivalent of over 19,000 cubic feet of gas at atmospheric pressure.

The auxiliary and fuel handling building ventilation system continuously filters, monitors and disposes of radioactive gases released to the atmosphere of these buildings. This is accomplished by passing air through HEPA filters and charcoal absorbers prior to monitoring and release. In this manner radioactive particulates and iodine are removed. The temporary filter system installed on the auxiliary building after the accident has been deactivated and the permanent system just described is now in use.

The reactor building purge system performs a similar function as the auxiliary and fuel handling building ventilation systems. Periodic purge operations will be conducted to remove trace amounts of gases during recovery.

During the decontamination activities, extensive efforts will be made to minimize airborne contamination for purposes of worker protection. In such circumstances, building air could normally be released without passage through filters. Nonetheless, the filters will not be bypassed and all building air will be filtered at all times. Should airborne activity exceed a level which could adversely affect the public health or the environment, the releases would be automatically stopped by installed instrumentation and interlocks as required by Technical Specification No. 2.1.2.

EPICOR II has a waste gas processing system to process gases released to the chemical cleaning building. This sytem became operational in October, 1979, and performs functions similar to the auxiliary and fuel handling building ventilation system. The adequacy of this treatment system is addressed in the NRC Environmental Assessment of EPICOR II, NUREG-0591. It is there concluded that offsite radiation exposure will be $1x10^{-4}$ mrem/yr, less than 0.01% of the limits established in 10 C.F.R. Part 50, Appendix I.

The offgas cleanup system for the SDS will consist of a mist eliminator, a heater, roughing filters, HEPA filters and a charcoal adsorber in series. Offgas is drawn through this system by a 1000 cfm fan, monitored and discharged to the existing ventilation system. Offsite whole body dose from the gaseous effluent from this system is projected to be on the order of $4x10^{-3}$ mrem/yr.

It is possible that new gaseous waste treatment systems may be required for new facilities still in the planning stages -- e.g., the evaporator/solidification facility. If ongoing developments indicate the need for any other systems, review by the Commission will be obtained prior to operation.

C. Solid Radwaste Treatment System

During cleanup operations three types of waste are produced, processed, and planned to be shipped from TMI-2 as solid radioactive waste. These are: (1) spent resin and filters; (2) dry compactible trash; and (3) dry noncompactible trash.

The solid resins and filters from EPICOR II are now being stored in the interim liner staging facility. This facility presently consists of two reinforced modules. It is projected that up to six may be constructed. These are being built on an as-needed basis. The first was placed in operation in January, 1980, and the second is ready for operation. A system is in the planning stages for the solidification of these resins prior to final disposal in an approved burial facility.

The SDS resins and filters initially will be stored in the flooded spent fuel pool. The need for and degree of solidification of these wastes prior to shipment offsite is yet to be firmly defined by the Commission. Until resolved, handling beyond the fuel pool has not been finalized. Various alternatives, such as the interim liner staging facility, are being evaluated. Commission review will be obtained prior to selecting additional onsite storage methods.

Dry trash is shipped offsite without solidification. Where possible, the trash is first compacted to reduce volume. A trash compactor for use with 55-gallon drums is dedicated to the exclusive use of Unit 2. Temporary storage onsite is accomplished in an interim waste staging facility. A new facility is planned to replace that now in use. The waste is shipped to a licensed burial facility in accordance with Commission and DOT regulations. All of the handling of Unit 2 solid waste is done within the Unit 2 boundaries.

D. Summary

The liquid radwaste systems, waste gas systems and solid waste systems (existing at the time of the accident, installed since, or planned to be installed) at Unit 2 are thus adequate to serve all the requirements of Unit 2 during its decontamination. Needs for additional capability, not now foreseen, will undergo Commission review before they are placed in operation.

Accordingly, Section 1 and this section demonstrate that both Unit 1 and Unit 2 have all the waste processing capability they separately require so that neither need rely on the other for waste treatment. The next section will address the separability of the waste systems of the two units.

BY WITNESSES FUHRER AND MCGOEY:

SECTION 3 -- SEPARATION AND ISOLATION OF UNIT 1 AND 2 FACILITIES

The physical separation and isolation of Unit 1 and 2 facilities will accomplish two basic objectives. First, radioactive liquids and gases from the two units will not be intermixed within the plant. Second, effluent streams from each unit will be separately monitored and quantified.

A. Prevention of Intermixing

Cross connections for the transfer of radioactive liquids between the units will be blocked prior to the restart or Unit 1 to prevent inadvertent flow. Such lines, which were in place at the time of the accident, are: (1) line from Unit 2 reactor coolant bleed holdup tanks to Unit 1 reactor coolant waste evaporator; (2) line from the Unit 1 miscellaneous waste evaporator to the Unit 2 evaporator condensate test tanks; (3) line from several Unit 2 tanks to the Unit 1 liquid waste disposal system; (4) line for transferring evaporator concentrates between units; and (5) line for movement of spent ion exchange resin between units. With the installation of the EPICOR II system other lines interconnecting the units also were installed. All of these lines are further identified and described in Section 7.2.1 of the Restart Report. A means for peventing flows between units through these lines also is described in Section 7.2.1 of the Restart Report. The

Commission Staff has reviewed the proposed methods for separation and has found them acceptable. Staff SER at C4-4 through C4-5.

The lines identified above are those which, if not blocked, would permit the ready movement of contaminated water from one unit to the other. There are other connections between the units which are not likely pathways for transferring radioactive liquids from one unit to the other. These are the auxiliary steam and condensate, demineralized water, and industrial waste systems. The liquids in these systems are not contaminated under normal conditions. Evaluations have been performed regarding the inadvertent or uncontrolled radiological contamination of these systems. It has been determined that sufficient control, through the existence of locked valves, check valves and system configuration, exists to maintain the uncontaminated nature of these systems. If the potential for contamination were to arise, the system(s) could be isolated through valve closure or by the installed check valves. Thus, it is concluded that existing methods are adequate to prevent inadvertent transfer of radioactively contaminated liquids via these systems.

On March 12, 1980, the Commission amended the Unit 2 operating license by adding several new license conditions and Technical Specifications. Among the new license conditions was the following:

> 2.E.(3) The licensee shall maintain suitable tankage at TMI-1 that could be used to store waste water from TMI-2 at an appropriate state of readiness, should additional storage become necessary.

Since this license condition was added, "suitable tankage" has been defined as shielded tankage with a capacity of at least 100,000 gallons.

Operation of EPICOR II and related activities have freed up sufficient storage capacity in Unit 2 that the Unit 1 storage reservation is no longer required. At the present time the license condition is being satisfied by reserving one Unit 1 and one Unit 2 reactor coolant bleed tank (total capacity of 154,000 gallons). Licensee is in the process of seeking modification of the March 12, 1980 order to reflect the increased storage capabilities at Unit 2 and to remove the requirement that Unit 1 storage be reserved for Unit 2 needs. Licensee has proposed that the required "suitable tankage", include only Unit 2 reactor coolant bleed tanks.

The two units also formerly utilized the Unit 1 primary sample laboratory. A temporary sample sink system has been installed to satisfy Unit 2 sampling requirements. This will obviate the possibility of cross contamination during sampling operations. Licensee's plan for the system is described in Section 7.2.7 of the Restart Report. See also Staff SER at C4-11.

The only place prior to separation where there could have been intermixing of contaminated gas was between the fuel handling buildings of the two units. Licensee's plan for separation of the fuel handling buildings is addressed in Section 7.2.2 of the Restart Report and in the Response to Question 52 set forth in Supplement 1, Part 2 of the Restart Report. See also Staff SER at C4-8.

Accordingly, appropriate plans have been made to prevent the transfer of radioactive wastes between the two units.

B. Effluent Monitoring

Provisions for separately monitoring and quantifying both the liquid and gaseous effluents from the two units have been in place since the units commenced operation.

Liquid releases from the radwaste treatment systems of the individual units are made on a batch basis. Since only one release at a time is permitted, it is not possible for both units to be discharging liquid radwaste concurrently. The procedure used to monitor a release is similar in both units. The contents of the tank to be discharged are isolated and sampled. The suitability of the material for discharge and the discharge flow rate are determined from this sample analysis. Flow rates are closely controlled and continuously monitored and recorded. Electronic valve controls insure that a second release cannot be started while a release is in progress. Independent radiation instrumentation on each unit's discharge monitors the release and verifies the radioactivity determined by sample analysis. An indication by the monitor that the projected amount of radioactivity is being exceeded will initiate termination of the release by automatic valve closure and stoppage of the discharge pump. An additional radiation monitor exists for the combined effluent at the river.

Gaseous wastes from the two units are discharged separately. No cross connection between the waste gas systems exists. Further, as described in Sections 1(B) and 3(A) of this testimony, the ventilation systems of the units have been separated. Each unit has separate gaseous discharge systems to collect, filter, monitor, and release radioactive gases in a controlled manner.

The ability to separately monitor and discrminate between Unit 1 and Unit 2 wastes is confirmed by Licensee's semi-annual reports to the Commission on TMI operation during the period when both units were operating. Those reports always differentiated between effluents from the two units, both liquid and gaseous.

BY WITNESS MCGOEY:

SECTION 4 --DECONTAMINATION AND RESTORATION AT UNIT 2 AND ITS EFFECT ON OPERATION AT UNIT 1

Earlier sections of this testimony have demonstrated that waste handling facilities at Unit 2 are adequate to safely contain and process the radioactive wastes now present at Unit 2 and those that will be generated during the decontamination and restoration of Unit 2 (see Section 2 above) and that the Unit 2 wastes will not be mixed with those generated during Unit 1 operations (see Section 3 above). This section of the testimony demonstrates that the Unit 2 waste handling processes, under both normal and abnormal conditions, will not adversely affect safe operations at Unit 1. This section of the testimony also demonstrates that Unit 2 is in a stable condition and that adequate means are available to maintain core cooling and to ensure against recriticality during the cleanup efforts.

Background information on the current status of the Unit 2 reactor is outlined in the first part of this section. Additional background information on the steps already taken, and yet to be taken, in order to decontaminate and restore Unit 2 are listed in the second part of this section. The current regulatory restraints on the cleanup efforts at Unit 2 and the manner in which they are applied by the Commission Staff to Unit 2 activities are described in the third part of this section. The fourth part of this section analyzes the potential impact of Unit 2 activities on Unit 1 operation.

A. Status of Unit 2 as of September 15, 1980

Listed below is pertinent information on the status of Unit 2:

- The reactor was being cooled by cyclic natural circulation.
- Reactor core temperature was an average of 134.8°F with a maximum thermocouple reading of 177.56°F.
- Reactor pressure was being maintained between 80-100 psig.
- Reactor coolant system boron concentration was 3900 ppm.
- Reactor building temperature was 82°F.
- Reactor building water level was 7.91 feet from the floor.
- Average reactor coolant system leakage rate was 0.05 gallons per minute.
- Krypton-85 concentration in the reactor building was 5.0×10^{-4} uCi/cc.
- No liquid effluents were being released.
- EPA and NRC monitoring programs were continuing. No unexpected results were found.
- The EPICOR II system had processed 501,224 gallons of contaminated water. Water

processed was principally from general decontamination, additional accident related wastes, and in-leakage.

- Approval had been given to purge up to 72 curies of krypton-85 per week to dispose of krypton coming from sources in the reactor building such as off-gassing of the water.
- Plans were being made to make the third manned entry into the reactor building.
- One of the decay heat valves within the reactor building has been opened in preparation of tying in the mini decay heat removal system.
- Liners and filters from EPICOR II were being stored in module A of the interim liner staging facility. Module B is ready to receive liners as required.
- The submerged demineralizer system was undergoing installation.
- Engineering was proceeding on the interim waste staging facility.

B. Decontamination and Restoration of Unit 2

The principal activities which are related to the decontamination and restoration of Unit 2 are listed below. They are generally in chronological order, but, of course, there is a considerable degree of overlap as often two or more activities are underway concurrently.

(1) Place reactor coolant system in natural circulation mode. (Completed.)

(2) Install temporary filter system on auxiliary building. (Now deactivated with permanent system in service.)

(3) Start cleanup of low-contaminated waste with EPICOR I system. (Used principally for Unit 1 wastes and some Unit 2 nonaccident water. Use of this system will be discontinued prior to Unit 1 restart.)

(4) Reduce reactor coolant system pressure and temperature. (In process.)

(5) Process intermediate contaminated water from auxiliary building and other storage tanks with EPICOR II system. (Completed and in process.)

(6) Decontaminate auxiliary building and associated contaminated equipment. (In process.)

(7) Install (modular) interim liner staging facility. (Completed and in process.)

(8) Purge krypton from the reactor building. (Completed.)

(9) Install two 500,000 gallon storage tanks for processed water. (In process.)

(10) Process reactor coolant system water. (Planned.)

(11) Process reactor building water. (Planned.)

(12) Decontaminate reactor building. (Planned.)

(13) Switch reactor cooling to mini decay heat removal system. (Planned.)

(14) Install interim waste staging facility. (Planned.)

(15) Defuel reactor. (Planned.)

(16) Decontaminate reactor and its coolant system. (Planned.)

(17) Replace or refurbish reactor building equipment. (Planned.)

(18) Refurbish reactor and internals. (Planned.)

(19) Refuel reactor. (Planned.)

C. Regulatory Oversight of Unit 2 Activities

Since the accident on March 28, 1979, the Commission has taken a number of steps to regulate activities at Unit 2. Through these regulatory constraints the Commission and its Staff exercise unparalleled oversight with respect to Unit 2 activities. In this manner, it is the Commission's intent to assure that decontamination and restoration of Unit 2 are conducted in a safe manner and do not adversely affect Unit 1 operation. Set forth below is a brief chronology of Commission oversight at Unit 2.

On May 25, 1979, the Commission issued a "Statement" directing its Staff to prepare an Environmental Assessment on alternative proposals to decontaminate and dispose of radioactive waste water at TMI. Pending completion of the first part of this Assessment, Licensee was precluded from operating EPICOR II. In addition, pending completion of a second part of the Assessment, Licensee was precluded from discharging any waste waters (except for waste water decontaminated by the EPICOR I system and the discharge of industrial waste water). The decontamination and disposal of high-level waste water also was to be the subject of the further Assessment.

On July 20, 1979, the Commission issued an "Order for Modification of License," suspending the authority granted in Facility Operating License No. DPR-73 to operate TMI-2 (44 Fed. Reg. 45271 (August 1, 1979)). The order also directed that, pending further amendment of DPR-73, Licensee was to maintain TMI-2 in a shutdown condition in accordance with approved operating and contingency procedures. In Section II of the order the Commission found that "[t]he stable, long-term cooling [of TMI-2] is currently being maintained in accordance with [these] approved operating and contingency procedures * * *" (p. 1). Subsequent orders of August 20 and September 20, 1979, extended the time within which the further order modifying DPR-73 would be issued.

As a first step in preparing the Environmental Assessment specified in the Commission's May 25, 1979 Statement, the Staff issued, on August 14, 1979, a draft Environmental Assessment on the Use of EPICOR-II at TMI-2. On the basis of that Assessment and other information the Commission issued on October 16, 1979, a "Memorandum and Order" directing Licensee to "promptly begin the process of decontaminating the intermediate-level wastewater from TMI-2 by operating EPICOR-II" (p. 14). An "Order for Modification of License", issued on October 18, 1979, further implemented the October 16 order by proposing the modification of the Unit 2 operating license to add EPICOR II discharge paths and to include certain conditions on the operation of EPICOR II.[1]

On November 21, 1979, the Commission issued a "Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement" (44 Fed. Reg. 67738 (November 27, 1979)). This Statement gave notice that the Commission had directed its Staff to prepare a programmatic environmental impact statement ("PEIS") on the decontamination and disposal of radioactive wastes resulting from the Unit 2 accident. While it was recognized that such a PEIS could not serve as a detailed blueprint of the entire recovery operations, it was anticipated that the PEIS would assist the Commission in carrying out its responsibilities under the Atomic Energy Act and the National Environmental Policy Act.

---

1 Because a hearing was sought on this license modification, the proposed changes were stayed during the pendency of the hearing. The parties to the proceeding subsequently settled the matter among themselves, and a licensing board order terminating the proceeding was issued on December 3, 1979. Amendment No. 10 to DPR-73 issued on March 12, 1980. This amendment set radiological release limits on discharges from EPICOR II.

A further order modifying DPR-73 was issued on February 11, 1980. As set forth by the Commission (p. 3), the February 11 order:

> (1) define[s] operating parameters for the current safe, stable, long-term cooling mode for the facility (defined as the recovery mode), and delete[s] all other permissible operating modes so as to assure that operation of the facility in other than the stable shutdown condition of the recovery mode is precluded;
>
> (2) impose[s] functional, operability, redundancy and surveillance requirements as well as safety limits and limiting conditions with regard to those structures, systems, equipment and components necessary to maintain the facility in the current safe, stable shutdown condition and to cope with foreseeable off-normal conditions;
>
> (3) prohibit[s] venting or purging or other treatment of the reactor building atmosphere, the discharge of water decontaminated by the EPICOR-II system, and the treatment and disposal of high-level radioactively contaminated water in the reactor building, until each of these activities has been approved by the NRC, consistent with the Commission's Statement of Policy and Notice of Intent to Prepare a Programmatic Environmental Impact Statement (44 F.R. 67738).

Although the effective date of the formal license amendment incorporating the proposed Technical Specifications has been stayed due to a request for a hearing, the Commission has amended its July 20, 1979 order so as to make these requirements immediately effective. A Safety Evaluation and Environmental Assessment (NUREG-0647) was issued concurrently with the February 11, 1980 order.

The proposed Technical Specifications attached to the February 11 Order (and made immediately effective) include two particular specifications of special interest to the restart of Unit 1.

Specification 3.9.13 provides:

> Discharge of water processed by the EPICOR II system shall be prohibited until approved by the NRC. Water processed by the EPICOR II system shall be discharged in accordance with procedures approved pursuant to Specification 6.8.2.

And, specification 3.9.14 provides:

> Processing and discharge of water in the Reactor Building sump and Reactor Coolant System shall be prohibited until approved by the NRC. Water in the Reactor Building sump and Reactor Coolant System shall be processed and discharged in accordance with procedures approved pursuant to Specification 6.8.2.

Through these specifications the Commission can assure that future Unit 2 clean up activities do not adversely affect safe operation of Unit 1.

On February 19, 1980, the Commission's Acting Executive Director for Operations appointed a Special Task Force on Three Mile Island Cleanup "to evaluate the cleanup operations at Three Mile Island, how they are being accomplished, and the rate at which they are being accomplished to ensure that the public health and safety is being protected." The Special Task Force, chaired by Norman M. Haller, Director, Office of

Management and Program Analysis, issued its Report on February 28, 1980. The Report contains a review of progress on cleanup activities, a summary of findings, a list of recommendations, and a general review of cleanup-related matters in the form of questions and answers. Included as Appendix 3 to the Report is an analysis of postulated accidents and the offsite consequences of such accident scenarios.

In order to facilitate the cleanup activities at Unit 2, on April 7, 1980, the Commission approved a set of interim criteria limiting the release of radioactivity from Unit 2 decontamination, data gathering and maintenance operations. These criteria require that Licensee seek and receive Commission approval prior to undertaking such activities (see SECY-80-175 at 2). The Commission Staff is to review Licensee's proposals to ensure compliance with applicable Technical Specifications, the ALARA concepts of 10 C.F.R. Parts 20 and 50, and the design objectives of 10 C.F.R. Part 50, Appendix I (id. at 3). These procedures are being implemented in the following manner (id. at 3-4):

- The Deputy Program Director, TMI-2 Cleanup, onsite will have the authority to permit weekly releases which result in offsite doses that are not greater than 5% of the annual Appendix I, 10 C.F.R. Part 50 design objectives normalized to a weekly rate.

* * * * *

- The Director of the Office of Nuclear Reactor Regulation (NRR) will have the authority to permit weekly releases which result in offsite doses that are not greater than 50% of the annual Appendix I to 10 C.F.R. Part 50 design objectives normalized to a weekly rate.

* * * * *

- Releases which may result in offsite doses in excess of those described above require approval by the Commission.

On June 12, 1980, the Commission issued a "Memorandum and Order" and an "Order for Temporary Modification of License" authorizing the purging of krypton-85 gas from the Unit 2 reactor building. The purging was completed as of July 11, 1980, and the temporary license modification lapsed as of that date.

In July, 1980, the NRC's TMI Program Office published "NRC Plan for Cleanup Operations at Three Mile Island Unit 2," NUREG-0698. The abstract to NUREG-0698 summarizes the document as follows:

> This NRC plan defines the functional role of the NRC in cleanup operations at Three Mile Island Unit 2 to assure that agency regulatory responsibilities and objectives will be fulfilled. The plan outlines NRC functions in TMI-2 cleanup operations in the following areas: (1) the functional relationship of NRC to other government agencies, the public, and the licensee to

coordinate activities; (2) the functional roles of these organizations in cleanup operations; (3) the NRC review and decision-making procedure for the licensee's proposed cleanup operation; (4) the NRC/licensee estimated schedule for major actions; and (5) NRC's functional role in overseeing implementation of approved licensee activities.

Most recently, on August 15, 1980, the Commission published in the Federal Register notice of the availability of the "Draft Programmatic Environmental Impact Statement Related to Decontamination and Disposal of Radioactive Wastes Resulting from March 28, 1979 Accident," NUREG-0683 (45 Fed. Reg. 54493). This comprehensive analysis contains information on the status of the Unit 2 reactor, the reasons and need for decontamination, the cleanup operations (including the treatment of radioactive liquids, the decontamination of buildings and equipment, defueling, and the packaging, handling, storing and transport of radioactive waste), the environmental impacts associated with cleanup, and various cleanup alternatives.

Taken together, the activities of the Commission and its Staff reflected by the orders, policy statements, safety evaluations, and environmental reviews issued in connection with the cleanup of Unit 2 evidence a unique degree of involvement in, and oversight of, the recovery operations.

D. Evaluation of Potential Impact of Unit 2 Activities on Unit 1 Operation

Potential effects of Unit 2 activities on Unit 1 operation arise either from a failure to maintain the Unit 2 reactor in a safe condition or from a radioactive release associated with the decontamination activities. Each of these matters is discussed below.

1. Maintenance of the Unit 2 reactor in a safe condition. As a result of the March 28, 1979 accident, Unit 2 is not now capable of normal facility operation. It is in a shutdown condition with fuel in the core. Unit 2 is being maintained in a safe and stable cooling condition. Systems are in place to ensure that decay heat from fission products is continually being removed and that subcriticality of the reactor core is maintained.

Since April 27, 1979, decay heat has been removed by natural circulation of primary coolant through the core with heat rejection through the "A" steam generator. The resulting steam is condensed in the condenser and recirculated to the "A" steam generator. Backup cooling modes are available. These include use of a modified "B" steam generator cooldown system and the normal in-plant decay heat system. In addition, work is almost complete on a new mini decay heat removal system. When functional, core cooling will be transferred from natural circulation through the "A" steam generator to the mini decay heat removal system.

Subcriticality of the reactor is being maintained through a high concentration of boron in the primary coolant -- currently about 3900 parts per million. For lack of precise knowledge as to the number of fuel assemblies which are in damaged condition, or the extent of damage, or the configuration of the nuclear material in the reactor vessel, a broad range of analyses, varying the relevant factors, was examined. These analyses show that the present boron concentration provides an adequate margin of safety even under the most adverse combination of core parameters.

This margin of safety would be lost if the boron concentration was sufficiently reduced by dilution. Since under normal circumstances the plant relies upon reactor coolant system boron concentration to maintain reactivity control, Unit 2 was designed so as to minimize the likelihood of inadvertent boron dilution by limiting the sources of pure water and the rate at which it can be added to the reactor coolant system.

These design controls have been augmented through a series of administrative controls to prevent an inadvertent boron dilution. Surveillance Requirement No. 4.1.1.2 requires Licensee to determine the boron concentration of the primary coolant daily by one method (mass balance calculation) and weekly by another method (chemical analysis). In addition, Surveillance Requirement No. 4.1.1.1 specifies precise methods for assuring that two systems capable of injecting borated water into the reactor coolant system are operable.

It is thus concluded that the means to maintain the Unit 2 reactor in a safe condition are in place and that the Unit 2 facility will not adversely affect Unit 1 operation.

2. Unit 2 recovery operations. The Unit 2 recovery operation is, of course, significantly different from a normally operating reactor in that the reactor has been shut down for an extended period of time and will not be in operation when Unit 1 restarts. As a result, power operation associated radionuclides -- i.e., those short-lived nuclides which are the principal contributors to accident associated doses -- have now essentially decayed away. Thus, the potential impact on Unit 1 from Unit 2 is not like that normally present when two nuclear units share a common station site. Rather, the impacts are those associated with decontamination activities. As is shown below, the risks to safe operation of Unit 1 from these decontamination activities are less than the risks from a normally operating reactor.

At the present time, Licensee anticipates using the EPICOR II system and the SDS to decontaminate the remaining quantities of waste water. Cleanup activities also will involve decontamination of the auxiliary and fuel handling buildings, the reactor building, and the reactor coolant system. These processes will generate further liquids requiring processing. It is possible that an evaporation/solidification facility may be used during the processing of some of the decontamination liquids. In addition, cleanup activities will include reactor head removal and eventual defueling. The impacts on Unit 1 operations from each of these activities are described below.

(a) EPICOR II

Accidents related to the operation of the EPICOR II system have been analyzed and are reported in NUREG-0591. It was found that the consequences of the accidents analyzed for this system were significantly less than those postulated on similar bases for operating units in their FSAR's and ER's. The conservative NRC analysis of postulated accidents in the operation of EPICOR II showed the maximum offsite dose to be less than 5 mrem to any member of the public from the worst accident analyzed. This can be compared to accidents analyzed in Section 15 of the Unit 2 FSAR which showed a possible dose (as from a fuel drop accident) in the hundreds of millirems using similar conservative assumptions.

(b) SDS

Accident analyses of SDS operation also have been performed. The possible consequences of accidents show the maximum offsite dose to be about 2×10^{-4} mrem. In this calculation, realistic assumptions were made. These assumptions would be comparable to the realistic analyses made in an ER. The accident analyses in the Unit 2 ER show, by comparison, potential offsite doses up to tens of millirems.

(c) Decontamination of Buildings and Equipment

The radiological impact outside the immediate area in which decontamination activities are being carried out is minimal. This is principally because such work is in an area with controlled ventilation that minimizes the spread of contamination and provides efficient filtration of the air prior to its release. Special precautions are taken to minimize local airborne contamination for the primary purpose of personnel protection. These precautions will be set forth in specific procedures prepared for each decontamination process. Further, there will be an automatic closure of the exhaust system should the effluent release monitors detect an excessive rate of release.

Planning for a possible evaporator/solidification facility to process decontamination liquids is not sufficiently advanced to project possible offsite doses due to potential accidents. However, based on the general characteristics of evaporator facilities, it is not anticipated that the consequences from an evaporator accident would be greater than those projected for EPICOR II or the SDS.

(d) Defueling

The defueling operation will involve the handling of both intact and ruptured fuel. As previously indicated, the short-lived radionuclides have decayed away and will not contribute to an accident-related release. With damaged fuel, the nuclide which can still result in any discernible offsite dose, krypton-85, has already escaped from the fuel (and been purged). With intact fuel, should the fuel be damaged in handling, the offsite dose to the whole body from the released krypton-85 would be less than 1 mrem, and there would be essentially no dose to the thyroid from iodine.

BY WITNESSES FUHRER AND MCGOEY:

SECTION 5 -- CEA CONTENTION NO. 5

CEA contends that the short term actions are inadequate in that they do not include provisions for denying restart of TMI-1 until the radioactively contaminated water from TMI-2 is fully decontaminated and disposed of in a manner that provides for no possible interference from that contaminated water with storage space that might be required in the event of a TMI-1 accident * * *, and that also provides for no possible accident in the decontamination and disposal of the TMI-2 radioactive water that might impact on the operation and emergency provisions of TMI-1.

BASIS: CEA contends that there is sufficient controversy over the potential effectiveness of EPICOR-II (see for example Dr. Louis Kosarek's response to NUREG-0591, the Environmental Assessment of EPICOR-II), and over the possibility of an accident involving EPICOR-II, that the possibility of such an accident happening and impacting TMI-1 cannot be dismissed. CEA further contends that the existence of present civil litigation concerning the decontamination and disposal of the TMI-2 radioactive water brought by the City of Lancaster, Pa., and by the Susquehanna Valley Alliance, and the prospect of further such litigation that may involve the State of Maryland and/or Harford and Cecil Counties in Maryland opposing the disposal of 'decontaminated' water into the Susquehanna River creates the distinct possibility of substantial delay in the disposal of the TMI-2 water such that it remains an encumbrance on the storage facilities of TMI that it may interfere with emergency storage facilities that may be needed in the event of an accident at TMI-1. CEA further contends that, absent an Environmental Assessment Statement or an EIS concerning the planned treatment and disposal of the water presently in the TMI-2 containment building, it remains to be determined if such treatment will be safe and adequate, and whether such treatment and subsequent disposal will not be delayed in such a way that it interferes with the provision of adequate emergency water storage space for TMI-1.

RESPONSE TO CONTENTION

The thrust of CEA Contention No. 5 is in two parts. First, CEA alleges that Unit 2 contaminated water must not interfere with water storage space at Unit 1 that might be required in the event of a major Unit 1 accident. Second, CEA alleges that Unit 2 decontamination efforts must be carried out in a manner that does not adversely affect safe operations at Unit 1.

As to the first claim, Section 1 of this testimony demonstrates that Unit 1 has sufficient liquid radwaste handling capability, including storage capacity, to safely contain the liquids that might be generated in a Unit 2 type accident. In particular, the Unit 1 reactor building could be used to contain any large quantities of liquid waste water. Sections 2 and 3 of this testimony demonstrate that Unit 2 cleanup activities will not rely on Unit 1 facilities and that the means of transferring wastes from Unit 2 to Unit 1 will be isolated prior to restart. There is thus assurance that the Unit 1 waste handling capability will be available for Unit 1 needs throughout the Unit 2 cleanup process.

As to the second claim, Section 4(D)(2) of this testimony demonstrates that Unit 2 cleanup activities present risks to Unit 1 operations less severe than if Unit 2 were an operating facility. Moreover, Section 4(C) of this testimony describes the extensive degree of Commission involvement in Unit 2 cleanup activities.

In addition to these two major points, the basis associated with CEA Contention No. 5 makes further allegations that are either inaccurate or unsupportable. A brief response to each of these matters is set forth below.

1. <u>Controversy over EPICOR II</u>. Since this contention was framed, EPICOR II has been successfully operating for almost one year. In that time it has processed about 500,000 gallons of intermediate activity waste water. At the time EPICOR II was authorized to operate, safety evaluations projected that EPICOR II was a safe method of decontaminating the intermediate activity waste water. The subsequent period of safe and successful operation fully confirms these prognoses.

2. <u>Existence of civil litigation</u>. Section 2 of this testimony demonstrates that Unit 2 has adequate waste water storage capacity even if discharge of processed water is not permitted due to ongoing litigation in the federal courts. Moreover, there are available alternatives to discharge into the Susquehanna River. These include: storage onsite for an

extended period, release to the air via controlled, forced evaporation, and reuse of the processed water during later decontamination activities.

In any event, the litigation (and potential litigation) cited by CEA has not adversely affected Licensee's ability to safely decontaminate Unit 2. The City of Lancaster suit was settled on February 27, 1980. By the terms of the settlement agreement, the Commission can authorize discharge of processed waste water whenever necessary in an emergency situation, or following notice and a public meeting, after completion of the PEIS or December 31, 1981, whichever comes first. The Susquehanna Valley Alliance suit was dismissed by the federal district court. The Third Circuit Court of Appeals affirmed in part and reversed in part. Licensee filed a petition for certiorari with the United States Supreme Court on September 9, 1980, seeking a ruling upholding the district court dismissal order. To date, the SVA suit has not affected cleanup operations at Unit 2. None of the potential litigation referred to by CEA has materialized.

3. Lack of an environmental impact statement. As indicated in Section 4(C) of the testimony, on August 15, 1980, the Commission published notice of the availability of the draft PEIS on cleanup operations at Unit 2. It is anticipated that the final PEIS will be issued by the end of 1980. Nothing in the draft PEIS indicates that cleanup cannot be conducted in

a safe and efficient manner. Licensee's own evaluations confirm that Unit 2 can be cleaned up without interfering with Unit 1 operations (see Section 4(D)(2) above).

It is therefore concluded that CEA Contention No. 5 is invalid and provides no reason for delaying the restart of Unit 1.

TABLE 1

UNIT 1 PRIMARY COOLANT WASTE HANDLING CHAIN EQUIPMENT

One 780 $ft.^3$ (5,500 gallons) reactor coolant drain tank: For suppression and collection of pressurizer relief and collection of process liquid from (i) valve stem leak-offs, (ii) the reactor coolant system, and (iii) the reactor coolant pump seals.

Two 11,000 $ft.^3$ (80,000 gallons) reactor coolant bleed tanks: For the collection of letdown from the reactor coolant system and condensate from the secondary system. Either of these tanks can also be used for injection of boric acid solution into the reactor coolant system.

One 11,000 $ft.^3$ (80,000 gallons) reactor coolant bleed tank: For injection of feed solution into the reactor coolant system. This tank can also accept letdown from the reactor coolant system.

Two 150 gpm precoat filters: For removing suspended and ionic solids from reactor grade water. One of these filters may be used for treating miscellaneous wastes.

Two 70 gpm demineralizers (normally cation resin only): For removing ionic solids from reactor grade water.

One 12.5 gpm reactor coolant evaporator: For concentrating the reactor grade water for reuse and producing a purified distillate.

Two 920 $ft.^3$ (6,500 gallons) reclaimed boric acid tanks: For storage of concentrated reclaimed reactor coolant grade water.

TABLE 2

UNIT 1 MISCELLANEOUS WASTE HANDLING CHAIN EQUIPMENT

One 3124 ft.^{3} (20,000 gallons) miscellaneous waste storage tank: For accumulating waste liquids from various sumps, vents and drains within the auxiliary and fuel handling buildings.

One 666 ft.^{3} (4,900 gallons) neutralizer feed tank: For accumulating and storing solutions to be neutralized.

One 194 ft.^{3} (1,000 gallons) neutralizer feed tank and mixer: For neutralizing solutions from the regeneration of the deborating demineralizer resins and adjusting the pH or for adding antifoam agent to miscellaneous and laundry wastes prior to their evaporation.

One 779 ft.^{3} (5,500 gallons) neutralized waste storage tank: For accumulating neutralized wastes prior to their evaporation.

One 1,120 ft.^{3} (8,000 gallons) spent resin storage tank: For the accumulation and storage of radioactive spent resin generated throughout the unit.

One 590 ft.^{3} (4,000 gallons) used filter precoat storage tank: For the accumulation and storage of used precoat material.

One 12.5 gpm miscellaneous waste evaporator: For concentrating miscellaneous wastes for packaging and shipment offsite.

Two 920 ft.^{3} (6,500 gallons) concentrated waste storage tanks: For the accumulation and storage of bottoms from the miscellaneous waste evaporator.

TABLE 3

UNIT 1 EQUIPMENT COMMON TO BOTH (TABLE 1 & 2) WASTE HANDLING CHAINS

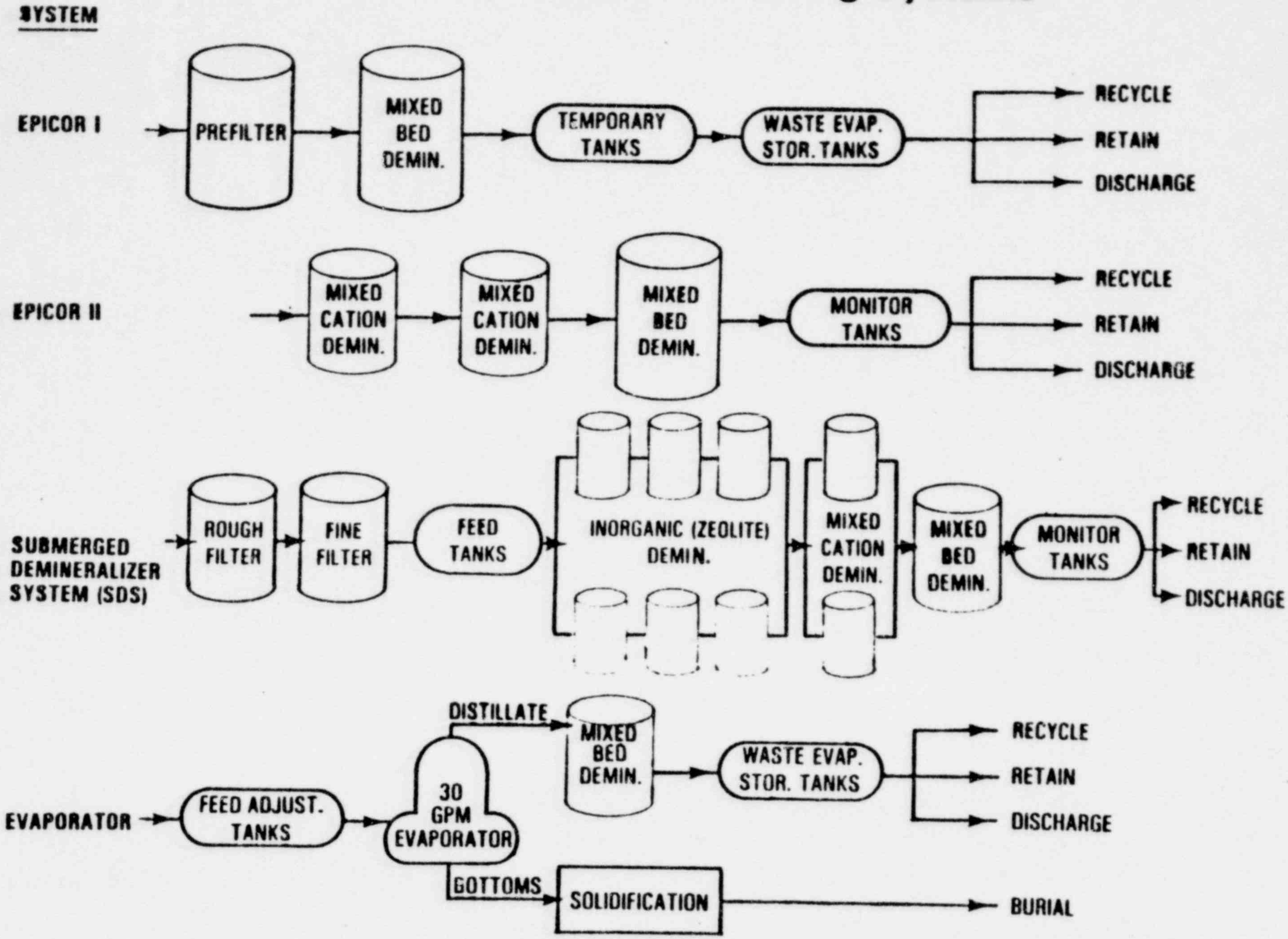
Two 15 gpm evaporator condensate demineralizers (mixed bed resin): For removing any borate and other ions that may have carried over in the distillate of the reactor coolant or miscellaneous waste evaporators.

Two 1,234 $ft.^3$ (8,400 gallons) evaporator condensate storage tanks: For accumulating, storing, and sampling the evaporator distillate prior to its recycle to the unit for reuse or discharge to the mechanical draft cooling tower effluent for disposal to the environment.

Two waste transfer/disposal pumps with flow and radiation monitors: To ensure that releases to the environment satisfy predetermined flow and radioactivity levels.

FIGURE 1

TMI-2 Radwaste Processing Systems



EDWIN C. FUHRER

Business Address: Metropolitan Edison Company
Three Mile Island Nuclear Station
Post Office Box 480
Middletown, Pennsylvania 17057

Education: B.S., Chemical Engineering, Drexel University, 1973.

Experience: Radwaste Supervisor, Metropolitan Edison Company, November 1979 to present. Overall responsibility for the operation and technical support of radwaste activities at Three Mile Island Unit 1, including decontamination and cleaning of reactor and auxiliary building areas, and the solidification, shipping and disposal of liquid and solid radioactive waste.

Radwaste Engineer, Metropolitan Edison Company, 1976 to 1979. Provided technical support for operations and project coordination for improvements to liquid and solid radioactive waste treatment and disposal systems, and other waste treatment systems at Three Mile Island Units 1 and 2, including work on waste evaporators and urea formaldehyde solidification systems. Following the Unit 2 accident, coordinated the installation of a portable liquid radwaste treatment system to use in lieu of the station waste evaporators.

Environmental Engineer, Metropolitan Edison Company, 1973 to 1976. Involved in water pollution disposal control for fossil fuel and nuclear power plants, and overall responsibility for an eight station ambient air monitoring network. Responsible for writing specifications and the evaluation of instrumentation to monitor the emission of sulfur dioxide and particulate matter. Responsible for the implementation of chemical and thermal monitoring programs in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) permits issued to power plants.

Professional Affiliations: Member, American Institute of Chemical Engineers.

RICHARD J. McGOEY

Business Address: GPU Service Corporation
c/o Three Mile Island Nuclear Station
Post Office Box 480
Middletown, Pennsylvania 17057

Education: B.S., U.S. Naval Academy, 1970
U.S. Navy Nuclear Power Training School, 1970-1971

Experience: Manager, Process Support, Three Mile Island Unit 2, GPU Service Corporation, March 1979 to present. Responsible for the overall management and processing of radioactive liquid waste, and the storage, shipping and disposal of radioactive solid waste, including management of miscellaneous support service.

Radwaste Engineer, GPU Service Corporation, 1977 to 1979. Responsible for corporate activities relating to evaluations of, and modifications to, radwaste systems at existing plants, and for the design and development of radwaste systems for new plant construction.

Nuclear Fuel Management Engineer, GPU Service Corporation, 1975 to 1979. Responsible for handling equipment and storage of nuclear fuel at existing and new nuclear power plants.

Nuclear Steam Supply Engineer, GPU Service Corporation, 1975 to 1977. Responsible for the overall design of new, and the evaluation of existing, nuclear steam supply systems.

Officer, U.S. Navy, 1970 to 1975. Served on two nuclear submarines, in various positions, including: Weapons Officer, Electrical Engineering Officer, Communications Officer, Security Control Officer, Engineering Officer and Ship's Duty Officer.

Professional Affiliations: Member, ANSI Subcommittee 14.9 on Shipping and Disposal of Radioactive Waste (standards development).