HR - 13

HOUSE OF REPRESENTATIVES

COMMONWEALTH OF PENNSYLVANIA

August 30, 1979

MEMO

SUBJECT: REVISED AGENDA - HOUSE SELECT COMMITTEE - TMI

TO: MEMBERS - HOUSE SELECT COMMITTEE - TMI

FROM: REPRESENTATIVE JAMES L. WRIGHT, JR., CHAIRMAN

The following will appear before Select Committee - TMI on September 5, 1979 and September 6, 1979. The Hearings will begin at 10:00 A.M., each day, in the House Majority Caucus Room.

William G. Kuhns, Chairman and Chief Executive Officer, General Public Utilities

Herman M. Diekamp, President, General Public Utilities

Robert C. Arnold, Vice President, General Public Utilities & Senior Vice President, Metropolitan Edison

Alexis Tsaggaris, Director of Site Emergency Planning, Metropolitan Edison

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COMMONWEALTH OF PENNSYLVANIA
HOUSE OF REPRESENTATIVES
HOUSE SELECT COMMITTEE - THREE MILE ISLAND

* * *

In re: Three Mile Island Hearing

Verbatim record of hearing held in the Majority Caucus Room, Main Capitol Building, Harrisburg, Pennsylvania, on Thursday,

September 6, 1979
10:00 A.M.

HON. JAMES L. WRIGHT, JR., Chairman
Hon. Bernard F. O'Brien, Vice Chairman
Hon. Nicholas B. Moehlmann, Vice Chairman
Hon. Eugene Geesey, Secretary

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Reported by:
Carol J. Christy

Dorothy M. Malone
Registered Professional Reporter
135 S. Landis Street
Hummelstown, Pennsylvania 17036

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ALSO PRESENT:

Robert Hollis

Ernest L. Blake, Jr., Esquire
Counsel for GPU

Fred Taylor, Esquire
Counsel

Marshall Rock
Assistant Director of Research

Peg Foran
Administrative Assistant

INDEX TO WITNESSES

CHAIRMAN WRIGHT: Good morning. Today the Select Committee is continuing its investigation with officials of General Public Utilities and Metropolitan Edison. Today we are meeting with persons responsible for the cleanup and rehabilitation of TMI and the emergency planning procedures for the utility. We have with us Mr. Robert C. Arnold, Vice President of GPU and Senior Vice President of Metropolitan Edison, who is the person responsible for the cleanup and rehabilitation of the Three Mile Island facility; and Mr. Alexis Tsaggaris, Director of Site Emergency Planning for Met Ed.

Since the subject matter which you gentlemen are going to discuss is inter-related, I am going to ask them to appear together.

Both of you gentlemen were sworn in yesterday. The oath carries through.

I understand you both have statements that you wish to make to the Committee, and I will ask you to proceed in making those statements. And after both of you are finished, we then subject you to interrogation.

Mr. Arnold, would you like to start?

MR. ARNOLD: Thank you, Mr. Chairman, members of the Committee. My name is Robert C. Arnol As Senior Vice President of Metropolitan Edison Company and Vice President of GPU Service Corporation, I had the Three Mile Island generation

group comprised of managerial, technical and administrative personnel from both Met Ed and GPUSC who have been integrated to support the activities at Three Mile Island. I welcome the opportunity to testify before your Committee and would like to make use of this opportunity to offer a status report on the situation at TMI. Specifically, I will describe today the activities that have taken place at TMI since the Unit 2 accident on March 28 and will give my views on what can be expected over the next several months as we proceed with the cleanup and rehabilitation of Unit 2.

In the months following the accident, our efforts with respect to Unit 2 have fallen into three categories:

One, making the necessary modifications to the plant and to the plant operating procedures to ensure reliable, long-term cooling of the reactor core.

Two, managing the radioactive waste materials released from the reactor core during and after the accident.

Three, attempting to identify what will be necessary to clean and rehabilitate the systems and equipment within the unit's containment building. I will review briefly each of these three aspects of our activities.

First among our priorities is to ensure the continued cool down of the Unit 2 reactor core. The radioactive decay of fission products created by operation of a reactor generates a substantial amount of heat even after the

reactor is shut down. It was inadequate removal of that decay heat immediately following reactor shutdown that caused the reactor core to overheat to a point that the protective cladding that contains the fission products failed and released some fission products into the water used to cool the reactor core.

The amount of decay heat produced by the shutdown Unit 2 reactor decreases steadily with time. Still, for many months to come it will be necessary to provide a mechanism for removing this decay heat in a reliable manner which does not depend upon active components located within the containment building. What I mean by this is that we have to assure that operation of pumps, utilization of instrumentation and changing of position of valves located within the containment will not be necessary to accomplish long-term cooling.

We have made modifications to the plant to achieve reliable long-term cooling and to assure that the method for removal of heat requires a minimum transport of reactor coolant to systems outside the containment building. We have been very successful in accomplishing both objectives and anticipate that long-term cooling of the reactor will proceed in a satisfactory manner in months to come. The reactor is currently being maintained at a pressure of 275 pounds, the average temperature of the water exiting the core is 165 degrees; the maximum water temperature across the top of the core is 250 degrees. The

reactor coolant system is completely filled with water, or "solid". Water is being circulated by natural circulation with the heat that is added to the water as it passes through the reactor providing the energy to circulate the water through the steam generator and back to the reactor. The final modification, which we expect to have in place by September 30, 1979, will enable us to shift cooling from the steam generator to circulation of the reactor cooling system water through a small heat exchanger specifically designed to accommodate the amount of decay heat being generated by that time.

The second area of activity by our group is the management of radioactive materials released from the reactor core during the March 28 accident. The main objective of our efforts in this area has been to minimize and monitor any release of radioactive materials into the environment through the two pathways that exist for such releases, that is the air and the various water systems in the plant that discharge into the Susquehanna River. We have exerted a maximum effort to ensure that releases are as low as can be reasonably achieved and do not occur with adequate monitoring.

Gases released from the auxiliary building or the fuel handling building normally pass through a ventilation system before they are discharged through a stack into the atmosphere. The ventilation systems have charcoal filters

that absorb radioactive iodine molecules and high efficiency particulate air filters to remove particulates. To guard against saturation of these filters, we installed a completely redundant full-size ventilation cleanup system in series with the original plant equipment. This new installation also includes activity monitoring equipment to measure the releases, if any, of radioactive gases, particulate matter and iodine through the gaseous pathway.

All liquids generated within both Units 1 and 2 are carefully monitored and are either stored or processed to meet federal and state regulations prior to discharge into the river. To provide additional storage of contaminated liquids that may be produced at TMI and cannot be processed immediately, we have installed additional tankage in the fuel handling building.

Concurrent with these monitoring, processing and storage activities, we have started decontamination of the fuel handling building and the auxiliary building. Decontamination involves two processes: collection of the radioactive fission products that are dispersed in the stored water into a form that is suitable for ultimate disposal, and cleanup of surface contamination on structures and equipment.

There are currently close to 300,000 gallons of water in the auxiliary building that need decontamination. Our plans for decontamination of that water are just about

complete; they involve the use of a system known as Epicor-II, which has been specifically designed for treatment of the auxiliary building water. Use of this system awaits approval of the NRC. An environmental assessment recently issued by the NRC staff, endorses the use of Epicor-II for the decontamination task. The assessment is now available for public comment. This assessment does not address the disposition of the water after processing through Epicor-II. The disposition of the water will be the subject of a separate environmental assessment to be issued by the NRC later this year.

As a result of decontamination activities, relatively large quantities of solid waste material will be generated These materials must be transported to one of the three licensed waste repositories. We intend to ship the waste materials generated during the TMI cleanup to the facility located in Hanford, Washington. Depending on the treatment processes chosen and the amount of materials that are gathered during decontamination, we expect that over the next three to four years we may make upwards of 2,000 waste shipments; under "worst case" assumptions there could be as many as 3,000 shipments. The decontamination of the water in the auxiliary building and fuel handling building will generate waste materials requiring approximately 200 shipments.

In connection with waste management, I would like to

address an item that received much publicity in recent weeks and was the subject of a resolution passed by this Committee, namely the discharge of 4,000 gallons of waste water from the TMI Unit 1 into the Susquehanna River last July. Two points need to be made with respect to that discharge:

One, the water was not discharged without previously being tested; and, two, the discharge was not initiated without the knowledge of the NRC representatives on site.

All discharges of water from TMI are controlled by formal, approved procedures that specify the sampling and analysis operations that must be performed and the approvals that must be obtained before discharge can take place. A few days before this particular discharge, a recommendation had been made by an NRC representative on site in the course of conversations with Met Ed staff that one additional test, known as gross beta analysis, not required by Met Ed's technical specifications or operating procedures, be performed prior to the discharge of waste water from the radioactive waste treatment systems. The Met Ed employees who talked to this NRC representative did not take issue with his recommendation, and the company does not take issue with it. Company personnel did not immediately initiate changes to the procedures that control discharges. Other Met Ed personnel, unaware of the NRC representative's recommendation, performed all tests required by the plant's technical specifications,

and on the evening of July 25, 1979 notified the NRC representative on site, who was a different individual from the one making the test recommendation, that the discharge would be initiated. The following morning the NRC representative who made the recommendation came on site and learned that water was being discharged into the river. He inquired whether the recommended gross beta analysis had been performed. He was told that it had not. He then requested that the discharge be stopped pending performance of the gross beta analysis. This was done, and the analysis was performed on a sample taken just prior to commencing the discharge. Results of the gross beta analysis verified that the water was indeed suitable for discharge.

The company regrets the misunderstandings that arose from this incident and acknowledges that prompter followup on the recommendations of the NRC representative would have been appropriate. We have been, and continue to be, receptive to the NRC's recommendations, whether formal or informal; and in this specific instance, our procedures were modified before making further discharges to incorporate a requirement that a gross beta analysis be performed prior to each discharge of water from the radioactive waste treatment systems to the river.

The third area of activity by our group is to prepare for the decontamination and rehabilitation of the containment building. The lower level of this building is now flooded with

about seven and a half feet of contaminated water, or approximately 550 to 600,000 gallons. On the order of 100,000 gallons of additional contaminated water are contained in the reactor coolant system. The water on the floor of the containment building and in the reactor coolant system is too heavily contaminated to be treated using the Epicor-II system. Instead, we are expecting to process it by means of a system under development by Chem-Nuclear Systems, Incorporated. We also have an evaporator system being designed which will be suitable for processing this water. Again, none of this water will be treated until the necessary NRC approvals have been received.

In addition to removing and processing the water in the containment building and the reactor coolant system, it will be necessary to decontaminate the building surfaces and equipment, remove the fuel from the core, and examine and repair or replace the systems and equipment within the building. To determine the best way in which these tasks could be accomplished, we commissioned Bechtel Power Corporation, a leading engineering and construction firm in the nuclear power industry, to prepare a scoping study on these tasks. I have with me copies of an initial report issued by Bechtel under this contract, which I offer as Exhibit 1 to my testimony.

Exhibit 1 covers only phase 1 of a three phase effort. Phase 1 ends when decontamination has progressed to the extent that access to the reactor vessel head area is feasible. Phase

2 will encompass removal of the head, removal of the fuel, decontamination of the reactor cooling system and inspection of the reactor cooling system components. Phase 3 involves the rebuild of the unit for service. Bechtel has also provided a preliminary assessment of potential cost schedule for all three phases, which I offer as Exhibit 2.

I will not dwell at length on these exhibits since you will have the opportunity to examine their full contents. Suffice it to say that the technical report contains a plan for the re-entry and decontamination of the containment building based upon calculated levels of contamination in the building. The analysis yielded a range of values for the degree of contamination existing in the building, going from a "best" to a "worst" case through a "most likely" intermediate estimate. I must caution that the results of the Bechtel study are preliminary in nature because the containment building has not been entered since the accident and there are uncertainties about the level of radiation and the condition of the facilities within the building. Some of these uncertainties will soon be dispelled, for we recently obtained a sample of water from the reactor building floor, and the sample is at this time being analyzed. Results of the analysis should be available by the end of this week. We expect that the analysis results will confirm our estimate that the release of fission products from the core was not as extensive as in the "worst case" postulated

by Bechtel and may not be even as severe as Bechtel's mid-range scenario.

The Bechtel study does not cover the decontamination of the auxiliary and fuel handling buildings. The significant milestones and associated dates identified by the company and by Bechtel are generally as follows:

1. Decontamination of the auxiliary building to permit its normal occupancy by the fall of this year.

2. Removal of the containment building water by late in the first quarter of 1980.

3. Initial entry and commencement of remote decontamination of the building in the spring of 1980. (I should point out that initial entry into the containment building may take place in advance of remote decontamination.)

4. Following its entry and remote decontamination, the containment building will be accessible for hands-on decontamination, and we anticipate the cleanup of the building to the point of being able to reach the top of the reactor vessel will take approximately a year. Thus, in the spring of 1981, we expect to commence the removal of the reactor vessel head to gain access to the core.

5. Completion of removal of the fuel from the core will take at least six months and would be completed by the fall of 1981.

6. Once the fuel is removed, we will be able to

decontaminate the reactor cooling system, inspect its major components and determine the degree of damage to the reactor cooling system piping and the thick-wall vessels. This effort would take us into the fall of 1982.

7. Finally, it will take approximately nine months to repair or replace the systems and equipment damaged as a result of the accident. Therefore, Unit 2 should be ready for restart in the summer of 1983.

While on the subject of decontamination, I would like to say a few words about another item which has received a substantial amount of public attention, the disposal of the krypton 85 gas which is currently part of the containment building air. Krypton 85 is an isotope of a noble gas with a half life of 10.7 years. In decaying, it emits low energy beta and gamma particles. Although a substantial amount of krypton 85 exists in the containment building air, the low level of radiation emitted by this gas makes quite moderate the off site dose potential that would result from its release. The Bechtel study estimates that if a person stood continuously at the Three Mile Island site boundary at the point of highest integrated dose of radiation throughout the 30-day period during which the gas could be discharged in accordance with the plant technical specifications that person would receive throughout the 30-day period a total exposure of .14 millirem to the total body from gamma particles and 14.8 millirem from beta particles,

mostly to the skin. The smaller number, that is the gamma exposure, would be the more controlling dose from a health standpoint because of the superficial (that is, skin) nature of the dose resulting from the beta radiation. Despite this very low level of projected dose, we are continuing to analyze the feasibility, cost and schedule of three alternatives to venting of the krypton gas that were identified in the Bechtel study. While Bechtel recommends venting of this gas as the preferred disposal method, no action will be taken to vent this gas or dispose of it by any other means until all alternatives have been studied, the results submitted to the NRC and the State of Pennsylvania, and we have satisfied ourselves that an adequate technical basis has been provided for whatever procedure we decide to utilize.

In closing, I want to emphasize that the company is dedicated to proceeding responsibly with the cleanup and recovery of Unit 2. We believe that responsibility includes expeditious and thorough cleanup of the contamination. We further believe that is the course that best addresses the issues of public health and safety. To this end, we are committed to strict compliance with the regulatory standards established for the release of radioactive materials and to continued close cooperation with cognizant state and federal authorities.

CHAIRMAN WRIGHT: Thank you, Mr. Arnold.

MR. ARNOLD: Mr. Chairman, perhaps this might be a good time to identify that I have brought with me today two documents which were requested at yesterday's hearing. The first one is a letter to the Kenley Commission Chairman signed by myself which provides all of the information and documentation relative to the information the company received on the Davis Bessie incident that was discussed in yesterday's hearings.

CHAIRMAN WRIGHT: Are those copies, or is that all one letter?

MR. ARNOLD: That is all one letter, sir. It is actually a letter with a number of enclosures.

I also have a document which we have identified internally within the company as DER TMI-116. It is an assessment of off site radiation doses from the Three Mile Island Unit 2 accident and contains the company's analyses of the off site exposures. This was requested at yesterday's hearing, and we have provided a copy of it.

CHAIRMAN WRIGHT: Mr. Tsaggaris.

MR. TSAGGARIS: Mr. Chairman and members of the Committee, my name is Alexis Tsaggaris. I am employed by Metropolitan Edison Company, currently assigned the responsibility of emergency planning.

Three Mile Island, the State of Pennsylvania and the associated counties had emergency plans during the March 28 accident. Since the accident, these plans have been undergoing

revision based on the lessons learned and available NRC guidance. The NRC has recently established a formal position with respect to emergency planning. This testimony will describe my understanding of the recent NRC guidance and its impact on Metropolitan Edison Company and the applicable state and local organizations.

The Nuclear Regulatory Commission has formed an emergency planning task force which has developed additional criteria and guidance intended to upgrade and integrate the emergency response capability at the licensee, state and local levels. In order to ensure integrated emergency planning, the licensee, state and local plans will be evaluated collectively against NRC regulatory requirements and additional acceptance criteria documents developed as a result of the TMI-2 accident.

The purpose of the task force is to ensure that the following emergency planning objectives are achieved:

1. Effective coordination of emergency activities among all organizations having a response role.

2. Early warning and clear instructions to the population-at-risk in the event of a serious radiological emergency.

3. Continued assessment of actual or potential consequences both on site and off site.

4. The effective implementation of emergency measures in the environs; and

5. Continued maintenance of an adequate state of emergency preparedness.

The NRC task force will conduct its review of the licensee, state and local plans for all operating reactors by using the review team concept. Teams will be comprised of three members, an NRC individual from the Nuclear Reactor Regulation Division who will act as team leader, an NRC individual from the Regional Office of Inspection and Enforcement, and a consultant from the Los Alamos Scientific Laboratory. Each team will be responsible for eight to nine reactor sites and will carry out its task in three phases.

The first phase will be a three week "review and site visit". During this time period the team will conduct a review of the licensee's emergency plan and conduct a site visit for the purpose of meeting with licensee, state and local representatives. At the end of this three-week period, the licensee will receive a report from the team which details the areas of the emergency plan which require further improvements in order to satisfy current requirements.

The second phase will consist of a five-week period during which the licensee will develop the necessary plans to comply with the areas identified during the three-week review period. During this five-week period, the state and local officials will be requested to revise their plans to address the specific comments from the three-week review period so as

to integrate with the licensee plan and thereby collectively satisfy the requirements set by the NRC task force. The revised licensee, state and local plans will then be submitted to the team at the end of the five-week period.

The final phase of the process will consist of a three-week period during which the NRC review team will collectively evaluate the plans and issue an evaluation report. The NRC task force eleven-week review process for Three Mile Island began on September 4, 1979.

The following are examples of the requirements contained in the recent NRC guidance: in the area of coordination of emergency activities, identify the interfaces between and among the on site functional areas of emergency activities, licensee headquarters support, local services support, and state and local government response organizations; designate an on site technical support center to be used for assessment of plant status and potential off site impact to support of the control room command and control function; and expand the emergency planning zone to require that the licensee, state and local organizations have the capability to effect protective action, including evacuation, out to a distance of ten miles.

In the area of early warning and instructions to population, establish emergency action levels related directly to the EPA Protection Action Guides. These emergency action

levels should include instrument readings and system status indications in addition to on site and off site monitoring readings. Provide for high range in-plant radiation monitors capable of measuring and identifying radioactive effluents under accident conditions. Provide for 24 hours per day manning of the communication link by authorities responsible for implementing off site protective measures. This was in effect prior to the March 28 accident. Describe the resources that will be used, if necessary, to notify the population within a ten-mile radius with 15 minutes following notification from the facility. Provide for the periodic testing of this communications link. Provide for periodic dissemination of educational information to the public; and provide an emergency classification scheme that is consistent with that established by the licensee.

In the area of continued assessment of on and off site consequences: provide for improved post accident in-plant sampling capability under high radioactivity conditions. Provide additional off site dosimetry as part of the radiological environmental monitoring program. Met Ed is in the process of implementing an expanded off site dosimetry program. Identify the agencies having a radiological assessment role out to ten miles; and coordinate and centralize the receipt and analysis of all field monitoring data and designate the lead agency for data coordination.

Ir the area of effective implementation of emergency measures: designate protective action guides and/or other criteria to be used in implementing specific protective actions in accordance with EPA guidelines. Describe the evacuation plan and/or other protective measures for areas out to ten miles. Since the accident, the counties within the ten-mile radius have developed evacuation plans for five, ten and twenty miles. Describe the protective measures to be used for the emergency planning zone associated with the ingestion pathway out to 50 miles including the methods for protecting the public from consumption of contaminated foodstuffs.

Finally in the area of maintenance of emergency preparedness: conduct a joint test exercise involving the entire federal, state and local response organizations every five years.

It is clear that the purpose of the NRC task force on emergency planning is to ensure that a comprehensive and integrated emergency response capability exists at the licensee, state and local level. It is my perception that the NRC guidance received to date is preliminary and will undergo revision as the educational process relative to Unit 2 continues. This will add to the challenge facing all organizations currently revising existing plans.

CHAIRMAN WRIGHT: Thank you.

ROBERT C. ARNOLD and ALEXIS TSAGGARIS, called as

witnesses, being duly sworn previously, testified as follows:

BY CHAIRMAN WRIGHT:

(To Mr. Arnold:)

Q Mr. Arnold, in your testimony you talked about shipments of waste material in the order of two to 3,000 loads over the next three to four years to the State of Washington. Does this burial site in Washington have the capability of handling that much material, and what happens if Washington would decide to follow the lead of the site in South Carolina or the site, I believe, in Nevada, which, in effect, closed itself down for any materials coming from TMI?

A We do anticipate shipping all of this material to the site in Hanford, Washington; and it does have the capability to accept that quantity of material. I think the result of the State of Washington deciding to proscribe shipments of TMI-2 waste to that site would put us in a very difficult position. The main thrust, as I understand it, of the position of the State of South Carolina, and I would expect of the State of Washington if they were to move in the direction which you indicate, is to emphasize to other states that do not have disposal facilities the importance of them looking to either local or regional disposal sites for disposal of radioactive materials. As indicated by Mr. Kuhns in his testimony yesterday, the company thinks it is very important that this matter

be addressed within the State of Pennsylvania, and it is my understanding from discussions with the Governor of South Carolina that movement on the part of the State of Pennsylvania or within the State of Pennsylvania to develop local disposal facilities would be the basis for them reconsidering their position with regard to the acceptance of Unit 2 waste.

Q Let's dwell on that a little further. Assuming that all out of state sites were closed to us, and I think in the supposition we could assume that the State of Pennsylvania, at least public opinion would not be infavorable to creating a site within the State of Pennsylvania, the federal government, the NRC or any other agency have any jurisdiction in making these decisions for us?

A This becomes, I think, a fairly complex issue rather quickly. Let me perhaps just comment on a couple areas.

First of all, the NRC clearly has jurisdiction and responsibility for regulating the amount of radioactive material at Three Mile Island and the physical condition, storage of any such material. We have the material there. It is not going to go away by the waving of either your hands or the hands of any regulatory body. So the NRC is faced with a condition that exists. And exactly what approach they would take in the event we could not ship any of the solid waste that we generate, I don't know. In terms of other potential disposal sites, the federal government does have disposal sites

for federal activities. Whether there could be developed the basis for utilizing any of those for receipt of TMI-2 materials, I really don't know that answer. The fact of the matter is that we have the material. We need friends in order to dispose of it. And I think, again, enlarging or expanding on Mr. Kuhns' testimony yesterday, it is not strictly a TMI-2 problem. It is a problem for the industry, and it is a problem for the various hospitals, universities and other industrial activities that generate nuclear waste. Approximately 20 to 25 percent of the waste that must be disposed of in the State of Pennsylvania is not associated with nuclear reactor operations.

Q Let me state the question perhaps another way; and if you can't answer it, say so. I think there's enough legal opinion floating around that NRC and the federal government has jurisdiction in regard to the operation of the plant. Does NRC or the federal government have jurisdiction in the location of waste disposal sites? And my question is location as opposed to regulation of the operation.

A It is my understanding that there are two methods by which a particular location could be licensed. One is by that location fulfilling NRC licensing requirements. I do not believe as a practical matter, aside from what the regulatory requirements might be, that such a site would be licensed by the NRC directly without the concurrence of the state agencies that would be involved. The second method by which a particular

location may be licensed is through the state becoming what is called an agreement state; that is that the state develops plans, regulations, procedures for the licensing and surveillance of operation of the disposal site. Those procedures, plans are then agreed to and approved by the NRC, and the state may then in that case proceed with the licensing of a disposal site. But the NRC, to my knowledge, could not identify a particular location and then proceed on their own initiative to make that a disposal site.

Q I think you probably have given us an opinion now.

A Yes, sir. That's clearly my opinion.

Q To your knowledge has there been any court cases on this subject?

A No, I am not familiar with any court activity.

Q To your knowledge, have you -- that is Metropolitan Edison, GPU and NRC or any other agency and/or organization come up with a list of possible proposed sites within the State of Pennsylvania?

A It is my understanding that a private company has done a survey of the geology characteristics of the State of Pennsylvania and identified a number of suitable locations. It is also my understanding, although I am not familiar with the details of it, that within the Department of Environmental Resources some staff work has been done with regard to identifying potential sites.

Q Do you know if any of this study or recommendations have been put into a report form? Have you seen a report?

A I have not seen a report, no, sir.

Q You mentioned a private organization. Do you know the name of that organization?

A Yes, the operators of Barnwell (phonetic), South Carolina site, Chem-Nuclear Systems, Incorporated, have done such a survey according to information I was given.

Q But you do not have that report in your possession?

A No, sir, nor did I see a copy of any report that may have been written. Chem-Nuclear Systems, Incorporated.

CHAIRMAN WRIGHT: Fred, would you make a note to contact Chem-Nuclear Systems and see if we can get a copy of whatever their study and report is. And also contact the Department of Environmental Resources to see if they have a study.

Representative Geesey.

BY REPRESENTATIVE GEESEY:

(To Mr. Arnold:)

Q Bob, what's the purpose of gross beta analysis?

A The purpose of a gross beta analysis is to verify that the assumption made as to the mix of isotopes that would be present in water that may be potentially contaminated is adequately reflected by the gamma scan type of analysis that

is normally performed prior to discharge.

Q All right. Let's assume that I am a layman, for the sake of argument, because we do have some laymen on the Committee. I happen to be one of them. Can we break it down into a little more understandable terms?

A Certainly. The technical specifications require us to do a test which is called a gamma scan and which identifies those isotopes which are present in detectable amounts that emit gamma radiations.

Q Which are?

A For a unit such as TMI-1, usually it is cobalt 58 or cobalt 60 that are the predominant isotopes; and they are not fission products. They are what we call activation products. That is they are corrosion products from the piping systems that have passed through the core and become radioactive as a result of the exposure to the neutron flux in the core.

When a core which has been operated has leakage in the fuel, then other fission products become potential contaminants in the system.

Q Such as?

A Here the ones of most interest are probably iodine and **cesium** (phonetic) isotopes. If iodine and **cesium** isotopes are present, that can be detected by the gamma scan, and the amounts of those particular isotopes can be identified. If they are present, then there is also a possibility of other

isotopes which are beta emitters, being present in the ones of most interest in that case or probably prontium (phonetic) isotopes. Because of the nature of the mix of fission products normally present in reactor cores, one can infer the level of strontium (phonetic), for example, that would be present from leaking fuel by measuring the amount of cesium that the ratio there would be quite reliably forecast, if it were. So by doing the gamma scan ahead of any discharge, we effectively provide ourselves assurance that the subsequent analyses which we are required to do for beta emitters such as strontium will show that those emitters were below their allowed level in the discharge.

Q But it is an assumption?

A It is an assumption. Now the purpose of the gross beta analysis was to ensure that that assumption remains valid, that is that the mix of isotopes found in the accident did not change for some reason; for example, perhaps, by treatment processes.

Q And by the use of that analysis, that process then is the only real way you are certain that your assumptions are correct?

A Let me say that it is probably the most easily utilized procedure.

Q All right. You indicated that an NRC representative on the site in the course of conversations with Met Ed's staff

suggested that one additional test, gross beta analysis. Who was the staff that the NRC made the recommendation to?

A The NRC representative believed that he had talked to three members of our staff. One is the supervisor of radiation detection in chemistry. One was a staff chemist, and one was the supervisor of the -- supervisor of radiation detection chemistry.

Q Did any of those three individuals at any point in time relay that information to you?

A That information was not relayed prior to discharge.

Q Did they relay it to anybody?

A No, and to the best of my knowledge they did not at the time of the conversation prior to the discharge followup on that suggestion.

Q You said a few days before this particular discharge the recommendation was made. What do you mean by a few days?

A My understanding of conversations with three different individuals took place separately, and one of those individuals did not recall the conversation, frankly, within the week prior to the time of that discharge.

Q So what we are talking about is something approaching seven days prior to the discharge they were told by the NRC to perform this particular analysis. And it was never done; and, accordingly, it appears to be the only way you could make certain that your assumptions of what was in the water was

really in the water, and it, frankly, is beyond me, Bob, why the chemists of all people, having been told this would not relay that information; and this is what really disturbed me at the time moreso than anything else. The whole concept of the accident disturbed me because it need not have happened had everybody fulfilled their roles. Enough was known prior thereto that it could have been stopped. But after it happened, and then along comes a situation where the NRC man says you should perform this test. He tells the chemist that a week before the discharge, and the test if never performed. You can understand where some of us have a problem where it endangers Met Ed's credibility where we have to wonder about the NRC and the whole mix of things here. It really, although tossed off lightly, was not a situation that ought to have been tossed off lightly. It was a case of complete disregard of a recommendation made by the NRC. And that bothers me.

A It bothers me, too, sir, very much. I don't think the sequence was tossed off lightly by the company. I personally interviewed the people that were involved just to identify why it happened. I think the significance of the event is what you identify, that is the need to ought to be able to give assurance to everyone that we can execute reliably. I think that the episode does need to be placed in the perspective of the literally hundreds of things that are going on at the Island, the dozens of recommendations that are made

and followed up probably by the --

Q Bob, you're right; but we're talking about water, and we're talking about making absolute certain that your assumptions of previous tests are correct, and we are talking about water that people use to drink or water that they need to sustain their livelihood. And there are times that I just get the impression that some people down there think that they're playing with a tinker toy set. And I am just not certain that some of these people understand the serious consequenses that are involved in their actions. And it just has a heck of a lot of people upset. Where the people who ignored the recommendations or forgot to relay the recommendations or misunderstood the recommendations, or however you want to classify, have they in any way been reprimanded?

A I think it's probably safe to characterize my investigation into it as having conveyed concern which I felt, and I think reflects the concern expressed by yourself as to the need for us to reliably execute and provide the basis in performance for the confidence that we are concerned, which I can assure you --

Q I presume you're saying reprimanded, or something close to that.

A I believe they were.

Q Okay. Bob, prior to the selection of Epicor-II, what other alternatives did you consider for the purpose of

decontamination of the water?

A There are two basic processes available for decontamination of water. Those are use of a resin type material, which is what Epicor-II consists of; and the other is the use of an evaporator system which evaporates some of the water which then is condensed and collected and leaves behind a more concentrated solution.

Q Would that latter system involve releasing of gases into the atmosphere?

A Not to any greater extent than the use of the Epicor-II will. They're relatively indifferent on that aspect.

Q Why did you select Epicor-II?

A The advantages of treating the water by means of Epicor-II are twofold. One is that Epicor-II results directly in the fission products being selected in a solid form, that is they adhere to the resin material. And we have then in a canister in a solid form.

The second is that the equipment is simpler and does not require the amount of maintenance and, consequently, a more reliable operation. There are limitations to the kinds of chemical contamination which an Epicor-II type system can function with. And if the additional chemical contamination is there, then we must go to an evaporator system. We are then faced with more highly concentrated liquids that must be solidified as an additional step before they are suitable

for disposal.

Q How would you solidify them?

A There's a variety of solidifying agents. Concrete is one that is commonly used, and probably would be the method employed.

Q Well, I pursued that particular avenue in the past and didn't get any kind of satisfactory explanation; but I'm glad you brought that up, because the point I have been making for some time is it could be solidified and moved in a form other than ice, as some people suggested.

Is the Epicor-IJ system cheaper?

A Yes, I think Epicor-II system is -- for an equivalent capacity of capability it is probably less expensive.

Q Considerably?

A Yes.

Q But if there is a possibility that it will not be able to do the job because, as you and, I guess, others have indicated, as you go down to the lower parts of water level, the more highly concentrated becomes the radioactivity. Will it be possible that you have to revert to other forms of purification anyhow?

A I'm not sure that we are expecting the contamination concentration in the reactor building to increase as we come down through the seven and a half feet except perhaps at the surface of the lower level itself.

Q Is it possible?

A I guess I would say it's impossible. I guess it's unlikely. The expectation though in the course of the cleanup is we will be encountering contaminated materials which are not suitable for processing by an Epicor-II type of process, so we are proceeding with the design and procurement of an evaporator system. That system though will take considerably longer to install, probably in the order of a year or two years.

REPRESENTATIVE GEESEY: I have no further questions now, Bob. Thank you.

CHAIRMAN WRIGHT: Representative Foster

MR. ARNOLD: Mr. Chairman, if I could perhaps clarify one item. Epicor-II is not meant to be used for the water in the containment, only for the water in the auxiliary. It will be a separate system steam technology, but a separate system that we expect to install for the treatment of containment building water.

CHAIRMAN WRIGHT: Okay.

REPRESENTATIVE FOSTER: Thank you, Mr. Chairman.

BY REPRESENTATIVE FOSTER:

(To Mr. Arnold:)

Q Mr. Arnold, this will lead into my first question then, namely on page six of your testimony you say that water on the floor of the containment building and in the reactor cooling system is too heavily contaminated to be treated using

the Epicor-II system. Instead we are expecting to process it by means of a system under development by Chem-Nuclear Systems, Incorporated. Could you define the term under development?

A Yes, the -- I'm glad you asked this. Perhaps that particular choice of words is somewhat misleading. We have being designed and manufactured at the present time a system which utilizes resin beds similar in concept to the Epicor-II system by the company that is referred to here. Now that system is expected to be ready for delivery and installation on the site by about the end of the year or beginning of 1980.

Q Would I be accurate in describing it as experimental in nature?

A No, I don't think that's the case. The process will be a process that conceptually and from practical standpoint, as far as experience with it goes, it is very common to systems which have been used in different related industries for probably 20 years. The unique aspect of the system is that it must be specifically designed for the facilities that we have available for installation of equipment so that the particular piping layouts and the locations of the monitoring equipment and that type of design aspect must be tailored to our installation. But the technology that's being utilized is quite commonly known.

Q Okay. I'll put the question in bold contention then. Is this a proven method of removing contaminants, radioactive

contaminants from water? Is it a proven bit of technology?

A Yes, sir. I think within every implication of your question it is a proven technology.

Q It has been used elsewhere then?

A Yes, sir.

Q Now along the same line with regard to the water in the several buildings, how much water are we speaking of altogether? I was under the impression that we were speaking of about 800,000 gallons of water total; but it appears to me from the figures here that we are dealing with more than that. On page six it says the lower level of this building is half flooded with 550,000 to 600,000 gallons of water, on the order of a 100,000 gallons of additional water are contained in the reactor cooling system. That would get us up around 700,000 gallons, and then I believe on page four there's some 300,000 gallons --

A I think if one were going to go back a couple of months ago, the number that we were using at that time totalled about 850,000 gallons. We have had some small amount of leakage continuously since that time in the system in the auxiliary building that carry liquids that are not nominally contaminated, that is not normally contaminated, as well as there being some small amount of leakage from the reactor cooling system itself. So in the period of the last two or three months, that has aggravated perhaps another 1,000 gallons and in the range of

900,000 to a million gallons at this time. The amount of water in the containment building is an estimate because of the volume that's available as the water floods up, and that's available for water as opposed to equipment and whatnot. But I think we're in the 900,000 to a million gallons range.

Q Now with regard to disposal of this water, it's -- your testimony emphasizes that while the Epicor system has received tacit endorsement by the NRC, they do not speak at all of this point to the disposition of the water itself.

A Well, that's because the order issued by the Commission directed the NRC staff to address those two issues separately with separate environmental assessment, so that the staff has only done the first part, that is the use of the Epicor-II.

Q Now when you removed the radioactive particles from the water by means of either Epicor-II or some other system, to what degree can you condense them for shipment, because the solid portions themselves, I understand, you plan to send to Hanford?

A Yes, the vast majority of the bulk of radioactive material will be very likely contaminated, so to speak. It will be compacted waste and non-compacted waste that, as I say, has very little level of contamination.

Q Where does that fit into the numerical sequence of the 2,000 shipments that you anticipated? How many shipments do you think may have such contaminants from the water?

A We anticipate that the shipments associated with the cleanup of the auxiliary building water, that is use of the Epicor-II, and the containment building water, that is the use of the Chem-Nuclear System, assuming that that proceeds as planned, would aggragate about 200 shipments.

Q That 200 shipments, so the remaining 1800 would be -- would consist of what?

A It would consist of, you might say, trash that is accumulated in the course of a cleanup process, coveralls, boots; and there will be some materials removed from the containment building actually that will be more economic to dispose of rather than clean of contaminated material.

Q Now insofar as the disposition of the water itself, has the company arrived at any decision yet as to the means of disposition of the water from the decontaminant process?

A We have not. We expect this month to complete the evaluation of the alternatives on disposal methods. I think that as a practical matter, we probably will have some need to, in a sense, recycle water as we are doing the remote decontamination of the containment building so that we anticipate the pressure for disposal is going to be relatively light over the next few months. We think that there is ample time for discussions as to the eventual disposal methods.

Q Do you think it's feasible to dispose of the water by -- well, I'll get right to the point of my question. The

people in my area are greatly alarmed at the possibility of discharge into the river. Do you think it's feasible to dispose of this water otherwise?

A The major problem we get into with looking at alternative methods for disposal is the ~~tradium~~ tritium (phonetic) concentration. The tritium concentration we anticipate in the cleanup water will be such that the water could not be transported under current Department of Transportation regulations without dillution because of the total curia (phonetic) content limitations on transport of liquids. There was a suggestion made yesterday that we ship the water to Hanford and dispose of it there. I might just clarify that the design and licensing restrictions on low level waste disposal sites prohibits the disposal of radioactive liquids at those sites so that that's not really one of the options that we are even looking at. The question of feasibility I hesitate to be too certain about because all the analyses have not been completed yet that I had my people working on in that regard. I think that the important thing from the company's standpoint is a recognition of the rules by which we have to live and that we anticipate that that water will be cleaned up such that it can be disposed of by more traditional methods in complete conformance with the regulations that provide protection to the public health.

Q Okay. So in my line of questioning yesterday when I suggested disposing of water at some site, possibly Hanford,

possibly South Carolina or wherever, I was assuming that we were dealing with water that was ostensibly pure water; but, on the other hand, if you cannot haul that water because of the Department of Transportation regulations, then I'm puzzled as to how -- if it's not safe to haul on the highways, I'm puzzled as to why it's safe to discharge into the river.

A Well, I think that probably the answer to that lies in the -- you might say the -- and I'm obviously conjecturing, but lies in the incentives for writing the Department of Transportation regulations to address transportation of radioactive materials, and this is not a material that one would normally expect to need to transport.

Q Under what regulations do you transport the other hazardous substances? Are we dealing with the same regulation?

A Yes, sir, we are. And the regulations are written so as to limit the total purity content that's involved with any liquid transport.

MR. TAYLOR: Excuse me, if I may, Mr. Foster. Could we carry on that subject.

What do you find to be your hindrance to this kind of waste, in re the state and federal laws regarding transportation over the highways or over rail systems?

MR. ARNOLD: The limitation is the Federal Department of Transportation regulations.

MR. TAYLOR: You mean DOE or Department of Transporta-

tion?

MR. ARNOLD: No, the United States Department of Transportation.

MR. TAYLOR: Any problems with the Commonwealth of Pennsylvania?

MR. ARNOLD: I'm sorry, I don't know the answer to that, Mr. Taylor.

MR. TAYLOR: Thank you.

BY REPRESENTATIVE FOSTER:

(To Mr. Arnold:)

Q Well, I'm still disturbed by the fact that contrary to Department of Transportation regulations to transport this on the highway that it could be discharged into the river.

Another line of questioning on the krypton 85. Could you give any idea of how much krypton we have in there? I just -- when I think of gases of this type, I'm thinking of them in compressed form in cylinders. Could you give any idea of the quantity of krypton 85 we might be dealing with?

A Excuse me just a minute, please, sir. I think it's safe to say if all krypton 85 was isolated and put in some kind of a package that was at atmospheric pressure and ambient temperatures, that the volume of that would be very small relative to the volume of the containment building. I believe that it's in the range of about maybe 20 to 50 cubic feet.

Q Only 20 to 50 cubic feet. I'm not a technician at all, but if that were compressed, what would you be talking about, one cylinder?

A Yes, from a volume standpoint, that would be very, very small. The difficulty that one encounters in attempting to place the krypton 85 into a small cylinder is that of that separating it out from the two million cubic feet of air that is within the containment building.

Q Is that a liquification process?

A That would be one method, and the other method would be equally as difficult, I think.

Q All in all, do you not feel that would be preferable than to venting that gas into the atmosphere with the attendant fears and the possible -- I'm speaking here both in terms of the krypton and the discharge of water into the river, the psychological consequences of this and the psychological impact on the economy of an area.

A I do understand the viewpoints that you're expressing, and I certainly don't want to convey the impression that the company is not sensitive to that. The discharge of water in particular has become the focus of a great deal of concern. The krypton 85 has the prospect for becoming every bit as great an issue, I think. It is part of the reason why we try to alert people that the Bechtel report contained that kind of a recommendation. From the company's viewpoint, those two issues

though have to be placed in the perspective of the literally hundreds of activities that we are going to have going on at Three Mile Island that people may also misunderstand as to what is their basis for having confidence that their public health is protected with regard to the krypton 85, in particular. I can assure you that we are looking very, very hard at the feasibility of other methods of disposal because we are dealing with a relatively small amount of material. If we can, with any reasonable alternative, then we'll pursue it. I'd like to emphasize very preliminary in nature, but the initial assessment that was done by some of my staff as to the most reasonable alternative involved about one year and a million dollars. Now the million dollars, I think, is not an unreasonable amount to consider, at least, for an alternative disposal. One year though might involve stretching the schedule by that amount, and then we're talking about 80 to $100 million cost associated with that dormant capital investment. So that the time aspect of this is a very critical consideration with regard to consideration of alternatives. The disposal of the water we can handle by other means, by interim storage while we wrestle with the concerns that exist with regard to its disposal. We don't have quite possibly though that same kind of flexibility with regard to the disposal of the radioactive krypton.

REPRESENTATIVE FOSTER: Thank you, Mr. Arnold. I have no further questions, but I would just like to emphasize

that whatever the cost might be, it may be cheap in the long run consideration of the psychological consequences of it.

CHAIRMAN WRIGHT: Five minute break.

(The hearing recessed at 11:20 A.M. and reconvened at 11:30 A.M.)

CHAIRMAN WRIGHT: Representative Hoeffel.

REPRESENTATIVE HOEFFEL: Thank you, Mr. Chairman.

BY REPRESENTATIVE HOEFFEL:

(To Mr. Arnold:)

Q Mr. Arnold, in your statement on pages five and six you discuss the controversy or the occurrence of 4,000 gallons, and you explain the company's position on that. Just to make sure that I understand your explanation, I think you indicate that when the NRC representative returned to the site of actually during the discharge, the morning of the discharge, and he came on site as the discharge was occurring, is that correct?

A That's the NRC representative who had made the recommendation?

Q Yes, who was not there the previous night.

A That is correct. There was a different NRC representative on the site providing surveillance coverage during the previous evening, and he was the one who was notified of the plans to proceed with the discharge.

Q And the evening NRC representative did not object to the discharge?

A That is correct.

Q Then when the morning NRC representative arrived and did object, the discharge was stopped?

A Yes, sir.

Q And you say that an analysis was performed on a sample taken just prior to commencing the discharge. Does that mean you took a sample of the water and set it aside and it was available for testing?

A Yes, sir, the same material that was available for the gamma scan, a portion of that was used for the beta analysis.

Q At that point, how much of the water had been discharged?

A The tank had about 7,500 gallons of water in it, and 4,000 gallons of it had been discharged at the time we stopped at the request of the NRC representative.

Q Then after the gamma test was completed, he had --

A After the beta test was completed.

Q I'm getting my terms confused. Which was the test that was not completed?

A The beta analysis was the one done after the 4,000 had been discharged, but done on a sample prior to commencing the discharge.

Q After the beta test was completed, was the remainder

of that tank discharged?

A No, it was not. I stopped all further discharges from the system until we completed revising the procedures that control discharges to include the requirement for a beta analysis.

Q The water has been discharged by today?

A Yes, sir, it was discharged, I believe, about the following week.

Q Has the NRC given you any explanation as to why their morning representative had not clued in the evening representative?

A I did not discuss that item with the NRC people.

Q On page ten of the testimony, you indicate in your discussion of the krypton 85 that the company will not discharge that into the atmosphere or dispose of it in any other way until the results of all testing are submitted to the NRC and the State of Pennsylvania. Does everybody in your company, are they well aware of this policy now that there won't be the same kind of mistake with the krypton 85 as there evidentally was with this 4,000 gallons?

A Well, I think I'll take exception to that type of possibility existing. I think I can assure you that there will be no reventing or releases of any type from the containment building without my personal knowledge.

Q Of water and gas?

A Yes, sir.

Q And will the state and NRC be fully aware in the future?

A Yes, sir.

Q In yesterday's comments you --

A Excuse me, but I would like to be sure that we are talking about with regard to the venting of the gas or the discharge of any water from the containment building.

Q Yes. I guess what I'm driving at is to make sure before anything is disposed of or discharged or disposed in any way that everybody who's supposed to be notified is notified.

A Everybody will be notified as is required by our procedures. As we discussed yesterday, that does not involve prior notification for each individual discharge to the state personnel for all discharges from the radioactive waste processing systems. It does involve prior notification to the NRC.

Q This Committee has the prior information, prior authorization, sometime in early spring, which was a matter that we discussed yesterday.

A I'm sorry, but I did not read that in the resolution passed by the Committee.

Q Well, as I understand it, we wanted to be notified, not this Committee, but we wanted state officials to be notified before at least any of the water, the contaminated

water, was disposed of. And that was one of the sources of our concern over the 4,000 gallons.

A Yes, sir, I think I understand that aspect of it. It is my understanding from the resolution that the Committee did not want any discharges of the water that I would say was part of the 900,000 to a million gallons that I have discussed before the recess discharged without state knowledge. I think that we have performed in accordance with that. The water that has been discharged from Unit 2 has, at worst, been water that had levels of contamination consistent with levels of contamination that would exist prior to the accident from the routine operations at the site. We cannot maintain the plant in a safe condition without being able to dispose of water that collects from the auxiliary building and the leakage o river water system that are used for cooling purposes, for example. That's the type of water which does flow through some drainage piping within the plant that also would have drainage of reactor coolant system leakage and, therefore, has the potential for slight contamination. It is that type of water, water that may be collected as a result of taking samples of water that has continued to be processed. But the water that has been of concern to this Committee, to my understanding, and of concern to the whole population, is being maintained is absolutely segregated as we can with the plant that exists.

Q The 4,000 gallons was not part of the containment

water?

A That is correct. It was not part of the containment water; and while we have no way of knowing with precision how much water came from Unit 2, I would say, at most, it was a very few gallons, perhaps even less than a gallon that had originated in Unit 2. It was almost completely Unit 1 water.

Q You indicated yesterday that for a while state officials with whom you were working were asking for prior notice before any discharge of any water occurred, but that sometime over the summer the desire for prior knowledge on the part of state officials was withdrawn and that that's one of the reasons you gave yesterday for the state not being notified ahead of time of the 4,000 gallon discharge. Is that an accurate statement?

A I would only express some uncertainty with regard to the time, and I did agree during one of the recesses yesterday that we would provide the Committee with a chronology of the meetings that we held with the state and the information that was to be provided to the state as a result of those meetings.

Q Fine, a chronology of those meetings and the people who were involved in the state's point of view.

A Yes. We may not be able to construct all of them, because we've had almost continuous communication with the state on a daily basis, communication; but we did have a series of meetings and a series of documentations of the data that was

to be provided to the state people. And I think that from our standpoint, at least, the state has been very diligent in maintaining awareness of what we are doing at the site. They have insisted on being able to review in detail the processes or the procedures that we use to control treatment and processing of water and its discharge. And I think, as I indicated yesterday, the main reliance on not having inadvertent discharge is through the use of the formal procedures, and the state was a party to the development of these special procedures that have been written since the accident to give everyone assurance that there would not be discharge of water in the containment building, for example.

Q I'd like to talk about the hydrogen bubble. I think Mr. DieKamp said yesterday that there was indeed a hydrogen bubble in the containment building during a crisis, that there was no possibility of an explosion. Would you elaborate on that a little?

A Yes. I think that what Mr. DieKamp stated -- and if he misspoke, let me correct the record -- is that there was indeed a hydrogen bubble in the reactor cooling system.

Q Within the reactor vessel, you mean?

A A portion of that hydrogen would have been within the reactor vessel underneath the head area. If one were to look at an elevation drawing of the reactor cooling system, you'd see the gas that was non-condensable would tend to

collect in the area of the reactor vessel and head there above the outlet nozzles in the top of the TH pipeing or the hot lake piping, that is the high point in the reactor cooling system. While there was a collection of substantial quantity of hydrogen gas in the reactor cooling system, some of which undoubtedly was not dissolved in the water but collected as a bubble, probably more correctly collected in two or three locations as a bubble, there was not a mechanism available for the generation of oxygen that would lead to its collection in sufficient quantities to provide an oxygen/hydrogen ratio sufficient to lead to either burning or an explosion of the hydrogen.

Q The information that was being expressed during the three or four days of the immediate crisis then of the possibility of a hydrogen explosion was not founded -- was not well founded?

A That is correct. Now I think a great deal of confusion exists perhaps as to timing. It was recognized on Thursday evening by the company personnel that the hydrogen bubble existed. I believe the NRC was aware of that probably on Friday morning, or at least the site NRC people were not aware of it probably until Friday morning. My recollection is that the issue of whether there would be a generation of oxygen and the subsequent explosion was not brought up until late on Saturday, and was not generally in the public domain

until Sunday. And, again, my recollection is that by Monday, the hydrogen had vented from the reactor cooling system into the containment building and removed any possibility for an explosion regardless of the presence of oxygen. In other words, it was not only impossible from the lack of presence of oxygen, but the hydrogen was no longer there in a sufficient quantity to form a gas bubble to provide the hydrogen for explosion.

Q There are hydrogen reconverter units, if that's the correct phrase, in the containment vessel?

A We have hydrogen recombiners, as we term them, as part of the plant equipment. Two of them were hooked up to piping which penetrates the containment building. The recombiners themselves were located outside the containment building. We utilized one of them with the second one as the backup to pump air fro[illegible]e containment building to that piping to the recombiner and discharge back into the containment building; so it effectively added as sort of a side screen processing piece of equipment. The hydrogen that was vented from the reactor cooling system into the containment building was [illegible]hen combined with oxygen to form water by that procedure.

Q Is there a need for improving the capability of recombining the hydrogen? It seemed to me that the hydrogen question was more intense than anyone ever really anticipated, that there was more hydrogen formed that the experts thought

ever could be and that the equipment wasn't really capable of handling it or they weren't sure it was capable of handling it.

A I think that's a very accurate assessment. The Nuclear Regulatory Commission task force reviewing the lessons learned from Three Mile Island accident had not yet resolved in their minds what they feel is the necessary equipment. The company is installing on TMI Unit 1 a recombiner similar to what was used on Unit 2. That recombiner has the capacity to handle hydrogen that is released at the rate in which the hydrogen was vented from Thursday evening through Monday. We were able to retain the hydrogen concentration in the building below three percent. But it certainly was not of the capacity to handle the very large amounts that were released on the day of the accident and which were burned off by the burning or detonation of the hydrogen that occured about 2:00 in the afternoon of the accident. It is not clear whether there's equipment available that would permit one to burn that hydrogen off in a controlled way in the event there is the generation to the same extent there was during the course of the accident. But that is being looked at by the industry and by the Nuclear Regulatory Commission.

I think, again, the major emphasis is on ensuring that we don't get into that situation again.

Q What if we do?

A Well, that's the purpose of the additional study to

identify appropriate equipment that could prevent the buildup of hydrogen in a containment building to where a detonation could take place. And there is a technical issue that is still under study.

Q Now, Mr. Arnold, we have talked a lot about waste disposal the last few days since you have been here, and it's been mostly focused on low level materials and waste products. We haven't talked about disposal of the accident fuel rods, which, I guess, are the most dangerous and the most difficult to handle of all radioactive wastes. It is my understanding that most of those nuclear wastes are kept in holding ponds on site pending some kind of national decision on what to do with the final disposal of those rods. Could you share with us your thinking as to what Metropolitan Edison would like to see as a final natural solution?

A Well, we think that reprocessing of spent fuel to recover the plutonium fuel source is the most desirable path to take. That obviously involves political decisions. I guess my perception is the system is not yet ready to make. Pending the making of those decisions in favor of reprocessing, we would anticipate that the federal government will provide, as they have announced they intend to provide, away from reactor storage for spent fuel assemblies. We think that the terminology for reprocessing the fuel, separating out the plutonium; or if that is decided not as desirable, for

solidification of the spent fuel waste is available to us, and we think that that's what the country needs to get on with very shortly.

There is, however, no technical difficulty with providing a way from reactor storage. The storage would be similar in nature to what we have on a more limited basis at the reactor site. We have the spent fuel from Unit 1 being stored at the site and the fuel handling building in racks and cooled which are designed for that purpose. We are, however, not currently provided with sufficient space to go on indefinitely. For the Three Mile Island Unit 2 fuel, which has been damaged, it is our expectation that that fuel is extremely valuable to the industry for the technical data that could be obtained from it relative to the accident, how the fuel behaved, what was the nature of the temperature and structural properties, changes that the fuel experienced. So we anticipate that there will be probably some type of federal research program or joint federal industry research program that will involve the commission of that fuel, and we will probably be shipping the fuel from the Unit 2 accident off site to that -- to a facility for that purpose.

Q The advantages of the reprocessing are, as I understand it, the extraction of plutonium, which allows it to be reused, recycled as a fuel source.

A It is not only the gathering of the plutonium that is

available in the spent fuel, but also the regathering, as a word, the recovery of the uranium 235, which still constitutes about one percent of the fuel and is about 40 percent of the original uranium 235 loaded into the fuel originally. We must have sufficient uranium 235 to maintain a critical mass, and that puts a lower minimum on it. With fuel designs, it is about one percent of the fuel at the end of life must still be uranium 235.

Q The processing allows us to use some of the fuel then, and the -- it still leaves a waste product or a final product that still has to be disposed of?

A Yes, it still leaves the relatively high level radioactive waste that must be disposed of. And that's what I was referring to as the company is convinced that the technology exists for solidifying that waste and disposing of it in an acceptable manner.

Q What do you suggest is an acceptable manner?

A I think that there has to be a couple of characteristics associated with acceptability. I mean first of all, we have to be confident that the fission products are not reachable, so to speak, that they will be contained for indefinite periods in the solid structure that is formed in the solidification of the waste. I think, myself, that initially the waste should be placed in a site from which they are retrievable.

Q Why?

A I think that the general public and probably many members of the technical community would be more comfortable with a reversible process, so to speak, so that if the new information is developed, new experiences gained show that there are preferred methods for the long-term disposal, that those can be utilized.

Q Well, what are some of those methods? Burial?

A Yes. I think the solidification, solidified material, would be placed underground in geologically stable areas where the geological features are conducive to dispersion of the heat that would still be generated, for example, and important assurance that there would not be a possibility of contamination of ground water, contamination such as that.

Q If you're having problems with the state being unwilling to accept the low level -- you being the industry, not Metropolitan Edison. If you're having trouble with the state accepting low level radiation, why do you think there will be acceptance for the burial sites for the more dangerous radioactive waste products?

A I think there's a couple of aspects to that issue. I think, as I mentioned, the political climate is not suitable at this time for making that type of decision. But I don't think that it's likely to be made in the immediate future. But I think the larger issue is that receipts to our understanding

of nuclear energy and the awareness we have of the disadvantages that are socially utilized in that energy source. I think as the nation becomes more aware of the problems that exist with other energy sources that there will be an increased capability to balance these against each other, to make the judgments as to which set of problems we want to address. And I think that when the public gains the awareness of the difficulties, the set of problems to be faced with regard to the utilization of coal, our only other major fuel source at this point. When they realize the blocks that are associated with continued high usage of petroleum and natural gas products, that we'll be in a better position to make the political judgment. Because no energy source is without a set of problems that have to be addressed, and it is more a matter of gaining confidence, I think, that those problems are manageable. My conception is that the problems associated with nuclear power are manageable.

REPRESENTATIVE HOEFFEL: Thank you, Mr. Arnold. Thank you, Mr. Chairman.

CHAIRMAN WRIGHT: Representative O'Brien.

BY REPRESENTATIVE O'BRIEN:

(To Mr. Arnold:)

Q Bob, in here they recommend that NRC use additional monitoring of these areas existing in all nuclear plants through

the United States, they're saying you should have additional monitoring stations.

A Yes, sir, it is. The guidelines Mr. Tsaggaris refers to, and I'll let him answer detailed questions in this area, are guidelines that are being applied nationwide.

Q How many do you have on site at Three Mile Island?

A I think the monitoring that you are referring to, or at least the portion that Alexis' testimony that I thought you were referring to is the off site monitoring or outside the plant proper.

Q We have Legislation that DER would be monitoring. The point I'm trying to get is I don't think the public would oppress what I read last time, trust the utilities in reading their own monitoring machines. So what I'm getting at is it duplicates -- is it duplication, or when NRC comes before our Committee that we could recommend some way or we pass Legislation that DER should be the one to do the reading? What is involved in and how much time is involved and how many times a day are those monitoring machines read?

A Let me talk first about water discharges. The DER has worked with the Environmental Protection Agency to establish a monitoring station on our water discharge. That is recorded continuously and has an alarm set point on which it alerts an EPA duty officer by a pager after hours. During the normal working hours, it is, of course, surveilled.

Q And all this equipment was bought by the company, and DER has a right to --

A No, this is equipment, as I understand it, that was either procured by the DER or was provided to the EPA. But it is equipment that is under the control for all aspects of it, maintenance, utilization of it, by the state; and the company has nothing to do with it other than we provide electric power to it.

Q That's on it. Now we're concerned about checking radiation in the area outside the plant. Who does that? Does the company do that?

A The company has a very extensive monitoring system. We have 20 TLV's, for example, that are around the plant. We are expanding that to in the range of 60 TLV's currently. We are looking at the second step which would take it up in the area of 80 TLV's. The state, in effect, audits the TLV's by having four of them out at locations that are essentially the same as ours, so that they have a cross check against the TLV's that we develop. The TLV's are normally read -- I believe it's quarterly, although I think we are currently monthly since the accident or only recently returned to quarterly. It involves going to the TLV site and carrying replacement TLV in shielded boxes and then relaying them being careful not to have any source of additional exposure to the TLV that's involved from the site. That TLV is then brought back to a machine which

reads it out on a machine. It cannot be read out directly at the location. So that the major monitoring effort is accomplished by the company, and I do not believe there is involved in the NRC guidelines that have currently been developed for any requirement for independent monitoring that would be an additional issue that is not addressed in their emergency plan.

Q Do you have one person doing that all day long, monitoring those different stations?

A No, we generally use the same set of two or three people for servicing the various environmental monitor stations, but it has not been under past quantity of work or amount such that it's a full-time job. I think it probably will become a full-time effort with the additional stations we are putting into place.

Q Then why wouldn't the company -- would you think Legislation would be in order if we legislate and said we want one state man there qualified to do the monitoring rather than have the company so they can report to the public and the company and pay for it by tne company? I don't like to see duplication, and you're doing it; but we want the state to do it, and we appropriated, which I think is a drop in the bucket, $300,000. Now are they buying equipment, too, to do the same thing that you people are doing?

A Let me pass to Lex to address that, because there

may be some confusion about what the state is doing with the funds that they have available.

Before I pass on to that though, let me address the first part of your question as to the company's position on having the state do it in place of the company. I don't think we have any difficulty at all with the environmental monitoring program being a program that is conducted by the state. There are federal criteria that must be fulfilled in the course of performing that off site monitoring, but that can certainly be fulfilled by the state as well as by the company. And the company is currently paying the cost of performing that monitoring. If it was decided that it would be preferable for that to be done by the state rather than the company, I don't think we'd find any difficulty with that approach.

Q But DER is there to do the monitoring of the water at the present time, aren't they? I mean they do take readings on the water discharge.

A Yes, they take readings on the water discharge, and we also provide them with a portion of samples they draw and they independently analyze those samples.

Q Does he go every day, or how much time does he spend there?

A I would say there's the equivalent of perhaps between one and two person days per week by state personnel at the site itself and performing a variety of surveillance and liaison

and review activities.

Q Yesterday you testified you have 20 personnel from NRC there. Could you tell me what the 20 people are doing?

A There are 15 people who come out of the -- excuse me. We have 12 people perhaps that come out of the NRC office of inspection and enforcement. These are people who are normally located at King of Prussia or one of the other regional offices for inspection and enforcement. And they are providing round the clock surveillance of the company's activities on both Unit 1 and Unit 2 assuring that we are performing functions and activities consistent with our procedures and our technical specifications. The other six to eight are from the NRC office of nuclear reactor regulation that is headed by Harold Denton. They are also providing overview of our activities. They are much more heavily involved in the front end planning review of procedures. They, in fact, approve all of our procedures that relate to safety of plant or to radiation exposure, environmental kinds of things. And their senior people attend the various status meetings and review meetings conducted by the staff at the station.

Q Normal operation, what's your personnel down there?

A The complement for Three Mile Island station is 335 people at the time.

Q In other words, you almost have one NRC man to watch each one of your guys. They really don't trust you guys, do

they?

A No. Our normal complement prior to the accident was 535 people. We currently have at the site about 850 GPU system employees.

Q Well that's counting outside. I'm talking about inside where these NRC people would really be.

A On a given shift that have shift operators and maintenance people on the shift, I would estimate we normally have about 25 to 30 people.

Q Do you really think that 20 personnel from NRC is needed down there?

A I don't think that it's substantially in excess of what's desirable to have. We, I think, have to realize that they are spread over four shifts approximately in order to provide round the clock coverage so that during the night time we probably only have two or three a month. On weekends, we might have four to six; and during the normal working day we might perhaps have eight or ten people. With the amount of activity that we have going on and the way in which we are attempting to gain the benefit of experience and capability that they represent, I don't think it's significantly over-staffed.

Q Can you tell this Committee a plant similar to the operation of Three Mile Island that NRC has any personnel in this plant watching the operation?

A The NRC has full-time on site representatives, as far as I know, at only perhaps ten or twenty sites; and that would be one person assigned to that site, and he would be augmented by inspectors that would come out of the regional office. Obviously they have focused on Three Mile Island Unit 2 differently than they have on other operating plants under construction.

Q Did you get the committee -- I'd like to get this Committee before NRC appears before you. I would like the breakdown of the duties of each one of the 20, what their duties are and submit it to the Committee so we can get that information.

A I'd be happy to provide you with our understanding of the assignments of those people, and we will try to do that.

REPRESENTATIVE O'BRIEN: Thank you.

CHAIRMAN WRIGHT: Representative Stuban.

PY REPRESENTATIVE STUBAN:

(To Mr. Arnold:)

Q Bob, you testified about waste here earlier, and you said there were two places, Hanford, Washington, and North Carolina. Why aren't you dumping at the closest one?

A Let me perhaps correct a couple of points there if I could, sir. There are three licensed sites: Hanford, Washington; Beatty, Nevada; and Barnwell, South Carolina. Shortly after the accident, the Governor of South Carolina

asked fairly forcefully that we not send any TMI Unit 2 waste to Barnwell. The site at Beatty, Nevada, offers no advantage in terms of distance for shipping to the Hanford site, and we felt that the Hanford site was a more desirable one for the activity that go on in that area; and I think what I can truthfully say is more general acceptance of the use of the burial site in the State of Washington as compared with Nevada, where there had been a number of problems, and we didn't either want to add to them or quarrel with them. So that the Hanford was selected on that basis. We did give assurance to their contractor that we would not send Unit 2 waste to South Carolina. We are sending Unit 1 waste to South Carolina.

Q You also mentioned that there was a site study to bury waste in Pennsylvania. Was this ordered by private industry, or was it ordered by state government?

A No, my understanding is that the Chem-Nuclear Systems, Incorporated, which operates the Barnwell, South Carolina site, did a survey; and I don't know how detailed the survey was, but it did a survey of potential sites say in Pennsylvania as a business venture on their part. There was no involvement in that activity to my knowledge but the state.

Q So you say it's a private study that they took on their own? In other words, you're out looking for business?

A Yes, sir.

Q Do you think that we can continue to generate waste

here in the State of Pennsylvania, and how long will it be before we are shut off by the other states?

A I think that question depends on whether within the State of Pennsylvania there is shown a willingness to look seriously at this issue. I think the Governor of South Carolina asked us not to send TMI Unit 2 waste to South Carolina in order to make a point. The State of South Carolina has been burying between 80 and 90 percent of the radioactive waste generated in the United States. There has been a substantial amount of activity at the federal level with involvement of various states to the development of regional disposal sites. Because of the political sensitivity of that, it is not moving ahead very rapidly. My perception from talking with the Governor of South Carolina and with Governor Reily of the State of Washington is that an active effort within the State of Pennsylvania to develop sites here, perhaps even sites that would only accept institutional waste that's generated by hospitals and universities and various research laboratories, some industries not associated with the nuclear power industry, would be sufficient to grant some re-assurance to those people that the State of Pennsylvania will move forward in this area as circumstances permit them to. But if there is not a -- I think a more positive approach taken towards this problem, and if it's not given some serious consideration, I think that before too much time goes by that the issue will

become much more acute at the out of state at any of those three locations.

Q With the storing of fuel on site and everything else, and there's some new plants that's going to come on line in the State of Pennsylvania, how long do you think the nuclear industry can continue to operate here in the state with their on site storages before there's a solution to the problem?

A Well, within the GPU system, we have been keeping close track of what our future storage capabilities currently are. I presume that the other utilities in the state that are utilizing nuclear energy are doing the same thing. And I think that we can provide on site storage that may involve construction of additional facilities, but we could handle the power plant at least with additional storage construction, the capability to restore the spent fuel during the lifetime of the plant. I think that's the matter of whether that's the preferred storage location rather than the technical issue.

Q There are townships in my district, and some of your nuclear waste is going up that way but it hasn't got into any of these townships. But there's one township in particular that has now adopted an ordinance against burial or transportation of nuclear waste through the township. If these begin to crop up throughout the state, what problems do you foresee they'll have on the nuclear industry?

A I think that can be a very substantial problem. I

believe there have been some court cases on the constitutionality, as it were, of the local ordinances concerning transportation of radioactive waste. It is my understanding that townships and municipalities do have to -- you might say ability to pass such legislation absent a prior designation of shipment routes by the Nuclear Regulatory Commission or the Department of Transportation, I think probably more correctly. So that that type of activity aside, I guess, from the legal implications which would be subject to tests, certainly reflect a resistance, as it were, on the part of the local people to those kinds of activities that will obviously complicate the utilization of nuclear energy. And I think that the presence of sufficient sentiment to result in the passing of such Legislation is indicative of the public policy of the public education challenges with which we are faced. I think that the association on people's minds with radioactive waste in nuclear power exclusively is also part of the problem. I don't think there's any hospital in the United States that would be accredited if they were prevented from shipping their radioactive waste. Duke University is the source, for example, of over 200 originators of radioactive waste. It is not a TMI-2 problem. It is not even just a nuclear energy problem.

Q I'd like to address a question on your emergency planning responsibility of Three Mile Island. Was this your job when this place was built prior to construction of it?

MR. TSAGGARIS: I came with Metropolitan Edison Company in 1976; and at that time my responsibilities were in the training area, and included in that was the staff training on emergency planning and the conduct and critique of the yearly exercises. At the time of the accident I was not working at TMI but assigned in Reading as maintenance supervisor of the fossil unit. Since the accident, I have been re-assigned to TMI with responsibilities in the emergency planning area.

BY REPRESENTATIVE STUBAN:

(To Mr. Tsaggaris:)

Q Well, concerning emergency planning and your knowledge of it, the industry was more concerned about the problems right on site than they were concerned about the problems off site?

A I would characterize the industry's concern as not only with on site but off site. There are requirements in the regulations which pertain to the utility in providing initial assessment off site and translation of that assessment to the various state and local bodies which have provisions for taking protective action. Those items were in place in the March 28 accident, so I would say that there's a twofold response: one on site and one off site.

Q Well, I notice now since the accident that NRC now is putting more emphasis on off site evacuation and coordination of some of these plants. Do you think that this is going to be costly, and how are we going to implement these plans? I know

there was some testimony here yesterday about how they thought we should pay them, but there's going to be a lot of costs to come. What's your opinion of how we're going to cover this?

A Well, quite clearly in the NRC recent guidance, they are calling for a collective look at emergency plans, looking at the state, local and utility plants as a collective unit. Part of the recent guidance increases the zone off site to a ten-mile radius for the ability to take protective action. Since the March 28 accident, the five counties which are inside the ten-mile radius, York, Lancaster, Dauphin, Cumberland and Lebanon, have developed draft evacaution plans for the five- ten- and twenty-mile radius. I think in that respect, those counties have taken a very good first initial step in meeting the additional criteria. There is no doubt that there will be additional costs to comply with some of these additional criteria. And I believe that Mr. Kuhns and Mr. DieKamp provided some ideas on how that could be funded.

Q There's a plant being constructed near my district, and they are now in the process of construction, emergency plans and everything else. And I know Bernie and I differ on this situation, and they are now requesting for citizen input and ask the citizenry to become involved. They set up a type of agency. Do you feel that -- I guess this can be a two-part question. Bernie's opinion is that the experts ought to draw up the plan. You know we talked about state and federal and

everybody else getting involved. Do you think that possibly the brains ought to draw up the plans and then present it to the citizenry, or the citizenry should have input right from the beginning?

A Talking about the brains, it is my opinion that in order to satisfy the new requirements, the collective requirements, the people that will be drawing up those plans will have to consist of utility representatives, the state representatives, the county Civil Defense people, Bureau of Radiation Protection and, perhaps, even as far as the local emergency management coordinators. These people at the state and local level are the representatives of, let's say, their constituency and perhaps have a very good feel for the kinds of plans that they would like to have in place. And I think that from that aspect that those would be the kinds of people that you would want to draw up the initial plans to meet the requirements.

MR. ARNOLD: I agree fully with Lex, and I might just add one other item to it, and that's that in the course of the hearings for the restart of Unit 1, there will be an opportunity for individual members of the public to, first of all, be aware in detail as a result of those hearings of what the emergency plans are and, also, to express any reservations or recommendations they would have as to the content of those plans.

MR. TSAGGARIS: Let me add also in the case of Three Mile Island that we have begun preliminary meetings with people from the emergency management agency, Bureau of Radiation Protection and on down through the county level in developing collective plans.

BY REPRESENTATIVE STUBAN:

(To Mr. Arnold:)

Q Before Bernie comes on here and asks questions, I'm going to ask a question because I know he's going to address it. If you were in the utility position that's in my district now who is asking for citizen input and getting involved and you were starting a new plant here for Three Mile Island, would you take this route immediately, or would you wait for the obstacle to jump in front of you when you come to the hearings?

REPRESENTATIVE O'BRIEN: Before you answer, I want to give my version of that. I think you're right. I really think that top people in government plus the chief of police in the area and everybody else are more educated on what has to be done. This is the way I feel about it. But I am not opposed to have the citizens come in later when a plan is finally drawn and then present it to the public and let them have input. But I think that PP&L has gone around it backwards, and I hope some of them are here.

MR. ARNOLD: I think that the public input, or the opportunity for public input, is very important. I guess I

don't feel strongly about either approach to it. I don't think in our situation for Three Mile Island it's practical to try to involve committees from the general public. If we were starting a new station and, in the course of the decisions involved with the location and providing awareness to the community of what that station is going to consist of and the potential impact it has on the community, and there is a tradition of public awareness and public discussion. Then I think the route that you are describing may have a lot of attractiveness to it. But I think I can kind of duck the question to another certain extent in this case because of the nature of emergency plans and the way in which they will be developed. There will be, I think, substantial input at a very local level, and there will be opportunity for additional public comment. I think I'd want to look at the specifics before making a choice as to which of the two of you I would want to side with on which was appropriate process for a new location.

REPRESENTATIVE STUBAN: I thank you both, and I'm sorry that I tried to put you in this position. This has been a thing with Bernie and I every place we go. We seem to be on opposite sides of this issue.

CHAIRMAN WRIGHT: Representative Itkin.

BY REPRESENTATIVE ITKIN:

(To Mr. Arnold:)

Q Representative Stuban mentioned the problems of the waste disposal, and I'd just like to discuss that area with you very briefly. What is your capability on site at TMI for handling spent fuel elements?

A We have provided as part of the original planned equipment systems which can remove the spent fuel from the reactor vessel and transfer steam within the plant's buildings from the containment building into the fuel handling building, and from there to place it in racks which are in pools. Prior to the accident we had the capability with those pools to go, I believe, to 1985, provided we made some modifications to the original rack design that would permit storage more than the original design provided.

Q Could additional construction be used to increase the storage capability, if necessary?

A I think for the Three Mile Island facility, if we needed to go beyond 1985 with on site storage, we would probably have to construct a new building for the purpose of storing spent fuel.

Q But you do not necessarily have space limitation for the storage of such materials?

A No, we have enough real estate available at the site. It would have to be a building independent of the present structures. We'd create a new building on site.

Q As far as Met Ed is concerned, this particular issue

about waste disposal is not a critical issue in terms of timeliness as far as you're concerned, or am I misreading you?

A Well, I think that absent the accident, the time would be fast approaching when it would be critical because of the administrative procedures which would have to be fulfilled to license, design and build such a storage facility. So we did not feel that we were in an immediate bind, but we had some preliminary work under way to start that process.

Q At the present level of storage of spent fuel --

A I'm sorry, sir, would you --

Q At the current level or capacity for the storage of spent fuel, which you assume would last you in normal circumstances until 1985, obviously under these circumstances you might be lasting to the year 2000. But on the assumption of 1985, there is a lot of expensive recoverable resource in that spent fuel, correct?

A Yes, sir.

Q What is the present, if that should be sent to a permanent repository, what would happen to that valuable resource?

A The program identified by the federal government for a way from reactor storage did not resolve that question, as far as I know, whether the company would retain title to the material in the federal storage facility or not. So I don't think that we know the answer to that question.

Q I just want to get on the record. If reprocessing is permitted on the spent fuel, there is significant amount of benefit to your customers because of the materials that are still present in the fuel element that could be recycled and reused.

A Yes, we think that the cost of reprocessing and recovering the plutonium and the uranium 235 that is in that fuel is well justified economically.

Q The Governor of South Carolina, you mentioned, asked you or deterred you from bringing in any waste from TMI. Has he halted or attempted to deter other institutions or other agencies from bringing in their waste of equally or greater radioactive characteristics?

A No, sir, he has not. At least to my knowledge, he hasn't. I'm quite sure I'd be aware of it.

Q So it was the origin of the material. In other words, you were discriminated against. It wasn't necessarily the character of the chemical or radiological character of the waste, but just where it was from?

A Yes, I think that Governor Reily was trying to make a point, and he was able to do that with a minimum impact on the industry in general.

Q Going to another point with respect to hydrogen buildup, you mentioned that that's an issue that still has to be considered. It is a technical issue, how to deal with the

hydrogen buildup. Now it is my understanding, and correct me if I am wrong, that the NRC has already instructed owners of B and W type plants to add vents at the top of the roof of the reactor vessel to disburse this hydrogen. Is this correct?

A It is my recollection -- I was just confirming it, that when Mr. Denton forwarded to the Commission the lesson learned task force, that his forwarding letter recommended that the short term modifications include high point vents from both boiling water reactors and pressurized water reactors. The lessons learned task force had not recommended that as a short term item.

Q Have not?

A They do not. Mr. Denton, in his ordering letter of this report, stated that he thought that should be done or else indicated that he directed it be done. I'm not sure of the contention of it right now, but the position of Mr. Denton is contained in the letter forwarded of the lessons learned task force report.

Q So in order for it to become a matter of policy, some more formal presentation to the licensees would have to be performed?

A Subject to some confirmation, perhaps after some more research, so to speak, I think that it's accurate to say that Mr. Denton could issue instructions to licensees requiring them to install such equipment on that facility.

Q It is my knowledge that consumers power company and the Midland one and Midland two have been, I think, constructed -- I don't know to what degree of urging or suggesting it was, but they are modifying their plant facilities right now to accommodate these events at the roof of the vessel.

A That is certainly the position taken by the NRC staff at this point; and, frankly, if we were in the position Midland one and Midland two is in right now, I would be proceeding with installing that equipment.

Q Let me go back now to the tridium. Perhaps -- and this is something that I'm not that familiar with. The tridium comes from where, or is present naturally where?

A Tridium is present in nature from cosmic interaction with hydrogen molecules. We generate it in the reactor core during operation through a number of -- well, I'll call it atomic interaction, so that the major portion of the tridium present in the plant is normally contained within the fuel bins themselves and is not released into the reactor coolant system.

Q You mean it's contained in the fuel bins, so it's within --

A Right. For some reference on that, the concentration of tridium in the reactor coolant water in reactor one, for example, is on the order of a tenth of a microperiod per millimeter, or a little less. The calculations that we have

done have indicated that if all of the tridium that would have been generated in the core during its operation was released during the accident to the reactor coolant system water, that we may have concentration in the water of the containment building on the order of one and a quarter to one and a half microcarries per millimeter, or perhaps a factor of 15 above or a little more -- let's say a factor of 20 above normal concentrations of tridium in reactor coolant system water. The water in the auxiliary building has been analyzed for tridium, and it ranks from about two-tenths to four percent of a microcarrier per millimeter, or perhaps a factor of perhaps seven or eight above normal concentrations.

Q What is the radioactivity nature of tridium? What type of radiation does it produce?

A Tridium is a beta emitter, which means that it is fundamentally only an internal hazard, or its only concern biologically is internal exposure.

Q And its half life?

A My recollection is its half life is somewhere in the order of 28 years.

Q And it cannot be removed from the present filtration -- I shouldn't say filtration, because that's incorrect -- resin in systems, absorption systems that you are presently planning to use?

A That's correct. It's atomically a variation of

hydrogen. Chemically, it behaves the same as hydrogen. Consequently, you can't use any chemical processes for differentiating tridium from hydrogen, and there are no practical methods for collecting the tridium.

Q And what about, for example, since it's chemically similar but extremely heavier form of hydrogen, has any thought been given to any types of graft separation or diffusion or something of that nature which would tend to reduce the concentration of the tridium in the waste liquid?

A Those kinds of processes have been attempted to laboratory scale. They are not practical in any sense of the word, I think, to be applied in an industrial application for treatment of the volumes that we're talking about.

Q But even if these were not done, you have complete assurance that the level of activity of material to be disposed of in the Susquehanna River would in no way be harmful, would be within limits acceptable to the public health agency's response for that activity?

A Yes, sir. Perhaps to provide some quantification of that, we have had some calculations done by staff as to what is the maximum exposure that would be received down stream in the event that we discharged the water to someone using the water for drinking, for bathing, for relaxation, boating, swimming, fishing, and eats the fish from the river. And I didn't volunteer earlier because I have not had it

quality controlled, as it were. But the calculations indicated that the maximum exposure that an individual in that situation could receive from the release of that water would be on the order of a couple or three-tenths of a millirem or less, the same order of magnitude as what we are talking about with the venting of the krypton 85 gas where we are talking about two-tenths of a millirem or less of integrated dose.

Q Representative Foster made the observation that although it may be physically harmless to the public health, there are additional concerns that he raised and, apparently his constituents raised, with concern to the emotional concerns and mental health of the affected population. Have you given any thought to perhaps removing this material using, say, barges for this purpose, barging it down the Susquehanna?

A The alternatives that we are looking at involve basically removal from the site by trucking.

Q But you say it is not permitted under current regulations?

A That is correct, but we are, for the purpose of study, assuming that that problem can be addressed one way or another.

Q Looking for a variance?

A Something perhaps in that nature. But I don't think that the regulations were written with this sort of regulation in mind. The removal from the site by evaporation into the

atmosphere would transfer it into a water borne dose potential to an airborne dose potential.

Q Do you have tridium in the atmosphere?

A Yes, there is tridium in the atmosphere.

Q In other words, you have your vapor -- your water vapor containing the tridium would then be in the air rather than in the water?

A That's correct, and it would be part of the total inventory that currently exists in the air. I might point out that tridium occurs naturally in the Susquehanna River at quite detectable levels.

Q Not radioactive tridium?

A Radioactive. All tridium is radioactive, yes, sir.

The third alternative that we are looking at is to tie it up in some solid form, and I suspected that involved making about as much concrete as was formed for the construction of the unit to begin with. And hopefully we wouldn't sink the Island, but it would be quite a monument.

Q You may have answered this question, but since you mentioned the natural occurrence or the background of tridium in the Susquehanna, have you done calculations to show just what the background would be after you have deposited this waste material? Would there be any significant increase in the tridium concentration in the Susquehanna River?

A Perhaps the best thing for us to do is to provide it.

I haven't made that kind of a calculation. But it can certainly be done, but probably more reliably under different environment.

Q Okay. Fine. My last line of interrogation has to do with health physics on site. Now periodically I have observed in the media reports of occurrences of abnormal exposure to on site personnel. And, consequently, because of these re-occurring reports, I am concerned about the possibility of over-exposure of the workers at TMI, and I wonder whether you share this concern?

A I do very much, sir. I think one of the major incentives for the processing of the water in the auxiliary building is to remove much of the potential that exists for over-exposure. I think it would be worthwhile for the Committee's purposes for me perhaps to talk for a few minutes though about the over-exposures that have occurred. To my way of -- to my viewpoint, I guess, if my perception of the significance of what's happened at the site, there have been three instances of exposures to workmen since the accident that I think are really significant in terms of indicating the effectiveness of the implementation of our radiation protection program. The first one occurred either the afternoon or the day after the accident when we did have health physics personnel who were taking a reactor coolant sample which was important to us in terms of understanding the nature of the accident and the conditions at that time, who did receive reportable levels

of exposure to their extremities and, in one case, to their skin. Now we have to make reports at levels that are well below levels of exposure from which one could expect to detect any health effects, but it still is a good reference point for us as to the effectiveness of execution of our procedures because we never deliberately expose someone to more than reportable levels or levels that require reporting. That was one instance, I think, that the extent of over-exposure was not significant in terms of potential health effects based upon my understanding of the medical aspect of it, nor were any of the other two instances at the level where we had concern as to the health effects.

The second one we referred to briefly yesterday where we had a buildup in the concentration of activity in the building that was not detected immediately. That came as a result of changing in the ventilation system, and we should have anticipated that the changing of the ventilation system line-up could affect the concentration of airborne activity and taken steps to watch for that.

The third one occurred a couple of weeks ago and was, again, a beta exposure as was the second one a beta exposure, that is basically a skin exposure, where the people had to go in to repair a valve that was leaking -- in fact, there were two valves that were leaking, and leaking reactor coolant system water into one of the buildings and leading to increases

in airborne levels. And there were higher beta radiation levels in that case, in that situation, and we were cognizant of, that we took into account in having the workmen go in there. There have been numerous other reports, because any time we have a person contaminated by loose surface contamination for any reason that we are not able to wash it off immediately and remove the contamination, we have made it a practice to make a public release on that. Those are more to head off misunderstandings than because the vent itself is of any significance. So in terms of evaluating where we are in implementing a radiation protection program, I look at those three which are three events in extraordinary, unusual circumstances over about a five-month period as really kind of indicators of where we are. It is a matter for an area that the NRC has been working with us very heavily, and we have brought in people from Canada that have been involved with accident situations in Canada. We have brought people in from the State of Washington that have federal facilities there, from the Savannah River project. We have gathered advice and counsel and assistance from across the nation to give the people at Three Mile Island and the public the assurance that we are executing radiation protection programs such that the health and safety of the workers is protected as well as the public.

Q Let me ask you this. In terms of the fears that seem to be exhibited by the surrounding population, the area,

at least some persons in the area, what is the reaction of your maintenance personnel on site to have to perform those jobs on a daily basis?

A I think the best indication of the reaction of the employees to the accident and to what extent they were alarmed is probably by the number that we've lost. And I think we've had perhaps five less resignations out of the 530 people who were at the site since the accident. In the NRC's investigation which included interviews with scores of employees there at the site, they made specific reference in their report to the positive constructive attitude of the employees and what seemed to be generally a very supportive attitude towards the company. I'm very proud, personally, of the response that we have seen from our employees, and we find that they are most anxious to get on with the business of cleaning up Unit 2 and getting Unit 1 back in operation as well, I might mention.

Q Even though the assignments may pose a potential hazardous occurrence to them?

A Well, I think that we have been able to convince them first of all, and we are concerned about their health, that we have procedures which gave them a high degree of assurance that they will not be over-exposed, let alone exposed to levels that are significant from a health standpoint. I think that we have worked very hard to try to explain to them the basis for the regulatory limits that exist with regard to

exposure, and we try very hard to make each of them aware of their own personal responsbility for their own safety and the safety of the people with whom they work. And I don't think they perceive that work as a high risk endeavor. I think they understand the need for being deliberate, being careful and being sure they understand what we are doing, because carelessness could lead to exposures that are of health significance.

Q Have there been any adjustments to their compensation or any other benefits provided to them as an inducement?

A No, sir, none.

REPRESENTATIVE ITKIN: I have no more questions, Mr. Chairman. Thank you very much.

CHAIRMAN WRIGHT: Bob Hollis.

MR. HOLLIS: Mr. Chairman, let me just follow up on that last question of Representative Itkin.

BY MR. HOLLIS:

(To Mr. Arnold:)

Q It was in the paper, I think yesterday or the day before, aren't you in the process of currently negotiating a contract down there with your employees, Met Ed and Three Mile Island? Is there currently contract negotiations going on?

A Not with Metropolitan Edison Company. Our company union agreement comes up for renewal, I believe, April 30 of 1980. We are in the process of negotiating a contract with

Bechtel Corporation for the management activities that I think we talked about yesterday briefly for management of the recovery effort. There was an article, I believe, on Monday in the New York Times in which the reporter, as I understand -- I didn't get a chance to read the article. That referred to a meeting which I had with Bob Georgine (phonetic), who is President of the building trades council of the AFL-CIO with regard to GPU's interest in having a building trades agreement negotiated specifically for Three Mile Island. It is fairly typical for these types of projects to have site agreements.

Q It was just I saw something about Met Ed was negotiating something.

I'd like to pose another question to you also. There's been much said about the disposal of nuclear waste and the transportation thereof. What does the Defense Department do with their high level ones. Do they have a storage facility, or do they reprocess it at that plant in Texas? The procedures there for processing of nuclear -- for reuse?

A Well, I guess a layman's understanding of it. My perception is that the various federal facilities, in effect, manufacture weapon material so that they have to process the equipment of spent fuel to separate out the bomb material or weapon material. That leaves them with high level waste, which is currently being stored in liquid form and what I would call engineered storage facilities. The amount of that waste is

probably more than a factor of ten greater an amount than what we have generated from the commercial application of nuclear power.

Q That's what I'm aware of. Here we have three commercial facilities, yet the Defense Department or the Department of Energy or whoever is manufacturing the fuel in having to send fuel and high radioactive waste storing it within that facility is unknown, or unknown probably to many states.

A Well, I think 60 Minutes was mentioned yesterday as giving some publicity to that. I'd like though to be sure that there's no misunderstanding of the licensed facilities that I identified are only for disposal of low level waste.

Q All right. Getting back to this low level waste disposal, there was some mention made of South Carolina has issued a moratorium on TMI-2, and you have mentioned the meetings that you have had with Governor Reily of South Carolina and Governor Ray of Washington indicating that they would be more willing to accept TMI-2 waste if Pennsylvania, per se, would start taking a look at possible storage sites within the Commonwealth. True?

A Yes, sir.

Q Have they had such discussions, to your knowledge, with the Governor of New York, New Jersey, Maine, Ohio, Illinois, you name every state, Virginia, where they have similar facilities

Have they had similar discussions with the Governors of these states and saying we want you to start putting sites in your state, or are they just picking on Pennsylvania because of TMI-2?

A I don't think they're picking on Pennsylvania. I think that through the Department of Energy sponsorship of the issue of regional disposal sites that the various state government representatives have been involved in the need for regional sites, if not each individual state having its own site. I think that it undoubtedly is the subject of conversation that things like the national governor's conference that took place a couple months ago at Kentucky. So I think there undoubtedly is a fairly substantial dialogue between the states in which tne Governors of the three states which have facilities pressed their concerns.

Q I have a question of Mr. Tsaggaris now.

Now I'll get to his statement on page three. On the bottom of the page, number four on the early warning and instructions to population, describe the resources that will be necessary to notify the populace within a ten-mile and all that sort of stuff. As I perceive this, it has the potential there that if a community did not want to expend funds or resources, not only funds, to provide a warning system that was acceptable to the NRC, that in this case it would have the potential of precluding the operation of a plant. Do you

perceive it that way?

MR. TSAGGARIS: I'll let Mr. Arnold answer that one.

MR. ARNOLD: That would appear to be the most direct reading of the guidelines. We have commented to the Nuclear Regulatory Commission as to what appears to be the impracticality of that type of approach.

BY MR. HOLLIS:

(To Mr. Arnold:)

Q That was the way I was reading it. I just wanted to find out if that was the way you read it also.

A I think that could quite readily be the inference of the guidelines.

Q Also they are talking about providing periodic information or dissemination to the public. That's on page four. Are they talking about the utility doing that, the NRC doing that, the state doing that? Who are they --

MR. TSAGGARIS: Not only in answer to that specific question, but in answering some other questions on a lot of criteria recently developed, we are in the process of attempting to get more specific guidance on a lot of the criteria that I have indicated. As far as I perceive the NRC's position, they have detailed specific requirements for the licensee. They have also detailed specific requirements for the state and local plants. Those, I'm sure, over the next several months will be re-adjusted in light of additional information. I

believe their approach is that for many of the criteria, they are taking the approach, in my opinion, that regardless of whether it's the licensee or the state or local government that that criteria will be met. It is our position in trying to hit a moving target, if I can use that term, to try and specify with our discussions with the NRC precisely what they mean with many of the criteria that they propose.

BY MR. HOLLIS:

(To Mr. Tsaggaris:)

Q Well, it had always been the policy that the NRC or the federal government has preempted the states in the licensing and everything of nuclear power plants. The state, in many cases, has had no input into the licensing procedure where they could, in effect, halt the licensing except for the public and potentially; but the NRC, in effect, could, even though everyone was against it, could issue a license. In this case, if the state or local communities do not wish to accede, you might say, to the NRC guidelines for the identified agency, provide additional off site this, describe what evacuation plans and everything, all these that are involved off site, they, in respect, have halted the further construction or licensing of nuclear plants, as I read it; and they have -- you have indicated in your testimony that the NRC has -- is currently performing an eleven-week study now which is running through the plant. What happens if local government and everybody

during the next ten and a half weeks decides to say no?

A Well, to give you a little background, and I'm sure someone will want to add some comments, the posture of the Nuclear Regulatory Commission in the past, the office of state programs, has been to work with the state and to ask for the state to submit plans on a voluntary basis for NRC concurrence. What you say is correct, in my opinion, and Mr. Arnold's previous comments, if you really get down to the root of the matter, that could be a possible interpretation. From my experience with the people that I have been involved with in emergency management agency and the county levels, I see a very positive approach to develop the kinds of plans that will collectively deal with emergency situations.

Q I happen to agree with you that this is the way it has been, but the certain areas, the certain officials are maybe taking a different stance than they took before, or a different position, that they no longer have the attitude. I'm not saying they don't.

MR. ARNOLD: Yes, I share the concern you're raising, or at least I have the concern that you're addressing with your comments or questions. I think that goes to the issue that we discussed yesterday in the testimony by Mr. Kuhns and DieKamp of the need for support from the state and local people if we are to get on with the responsbilities that we have to fulfill and which, in the broadest sense, reliable electric service. I

think that this clearly is the posture on the part of the NRC to try to provide more reality to the opportunity for public and state input into the licensing process. We, as a company, support that effort. We think that the more involvement that local and state people have, the better off we are going to be. We think that the public as a whole, or our customers as a category, certainly have to be protected against, perhaps, arbitrary or capricious actions on the part of a very limited group of people. And I think that's where we're looking for the support of the state and local people not to do the company's job but to provide us with the conditions under which we could do the job.

BY MR. HOLLIS:

(To Mr. Arnold:)

Q Well, in closing, could I ask that next week we have Mr. Ryan, who heads the state programs of NRC, and Denton appearing here. Would it be possible of Mr. Tsaggaris or you, Mr. Arnold, or someone could provide us prior to that meeting with some indications of your comments that you might have made on their proposals that we would be able to pursue the matter with the NRC people? I don't know whether we would be, but --

A We would be happy to provide you with our comments on those guidelines.

Q Okay, because my understanding it's next Wednesday is

when they are going to appear, so we would -- that's not many days, but we would --

A Yes, sir, we will respond accordingly.

MR. HOLLIS: Thank you very much.

CHAIRMAN WRIGHT: I think I would like to wind up this meeting today with perhaps a philosophical question. The commercial utilties in this country operate nuclear power plants. The United States Navy operates nuclear plants, primarily on board nuclear submarines, where they don't have the luxury of space to build in backup systems and redundant systems that the commercial operators may have. I would assume that a possible variable that might exist in comparing the two systems would be operators and operator training. Do you agree with me that they don't have the luxuries of space and redundancy that you may have; and if that be the case, what are they doing in providing for operators and operator training and various simulators, and things of that nature which commercial people are not doing?

MR. ARNOLD: Well, both Lex and myself are products, as it were, of the Navy's nuclear power program, so we do have some familiarity with it. I have read within the past couple weeks a number of documents that were produced by Admiral Rickover (phonetic) relative to his program.

I think that the first comment that I would make is that the Navy does have the equivalent degree of safety

protection, I think, for their nuclear plants as what we have with commercial ones. Their plants are certainly much simpler, and space is one of the issues. Reliability of operation under battle conditions is also a major design envelope within which they must design that plant. So they are faced with a different set of incentives from that overall plant design. They are faced with the same set of incentives from a safety standpoint though. And I think we basically approach the nuclear -- commercial nuclear field in a manner similar to what the Navy's program has approached, safety and providing safety. They do not utilize, and this is an area that Admiral Rickover in testimony before the Kenley Commission, came down quite heavily on, that they do not realize the degree of action and computer applications that the commercial nuclear power program is utilizing and as seen by some of the initial comments from some of the Kenley Commission and staff is the direction that they are going to be at least initially taking.

With regard to training, Admiral Rickover has provided for each class or plant that he has placed in the Navy fleet a full-sized prototype, and he has standardized his plant design for a class of ships. That provides a training facility for the Navy program which the commercial program does not currently enjoy in the same context. I might say that there is undoubtedly differences of opinion as to how important it is to have a precise replica of the plant and operators going to operate as

one of the training tools -- that that is where the simulator, in fact, has to be an exact carbon copy. I think Admiral Rickover feels it would be necessary. I think there's others that would feel differently as to the importance of that. But we have, I think, you might say molded our training program very similar to the training that is provided in the nuclear power -- in the Navy's nuclear power program with regard to the kind of academic background and kind of approach to training that has been utilized in the Navy's program. We are currently attempting to make a complete assessment of our company's training program as against the Navy's training program. That presents some difficulty because the Navy's information, some of the specifics of it, is classified. But we are attempting to take a fresh look at our training program with one of the reference points being what the Navy's program consists of.

We have two or three other activities under way to also assess our training program. So I think that the commercial nuclear power program has certainly learned and benefitted from both technical and personnel, staff and training aspect of the Navy program. Hopefully we have not used that as a crutch but is used as one of the many building blocks made in preparation of what we use to operate a nuclear power plant safely.

CHAIRMAN WRIGHT: We thank you for being with us and presenting testimony. I think the last two days have been

rather enlightening. We thank Metropolitan Edison and GPU for their time.

MR. ARNOLD: We thank you very much for the opportunity to provide testimony, sir.

CHAIRMAN WRIGHT: Thank you. The meeting is now adjourned until next Wednesday at 10:00.

(The hearing terminated at 1:20 P.M.)

I hereby certify that the proceedings and evidence taken by me before the House Select Committee - Three Mile Island are fully and accurately indicated in my notes and that this is a true and correct transcript of same.

Carol J. Christy

Carol J. Christy, Reporter/nc