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# NUCLEAR WASTE DISPOSAL IN MICHIGAN

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## OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON  
ENERGY AND THE ENVIRONMENT

OF THE

COMMITTEE ON  
INTERIOR AND INSULAR AFFAIRS  
HOUSE OF REPRESENTATIVES

NINETY-FOURTH CONGRESS

SECOND SESSION

ON

NUCLEAR WASTE DISPOSAL IN MICHIGAN

HEARING HELD IN LANSING AND ALPENA, MICHIGAN

JULY 6, 1976

**Serial No. 94-68**

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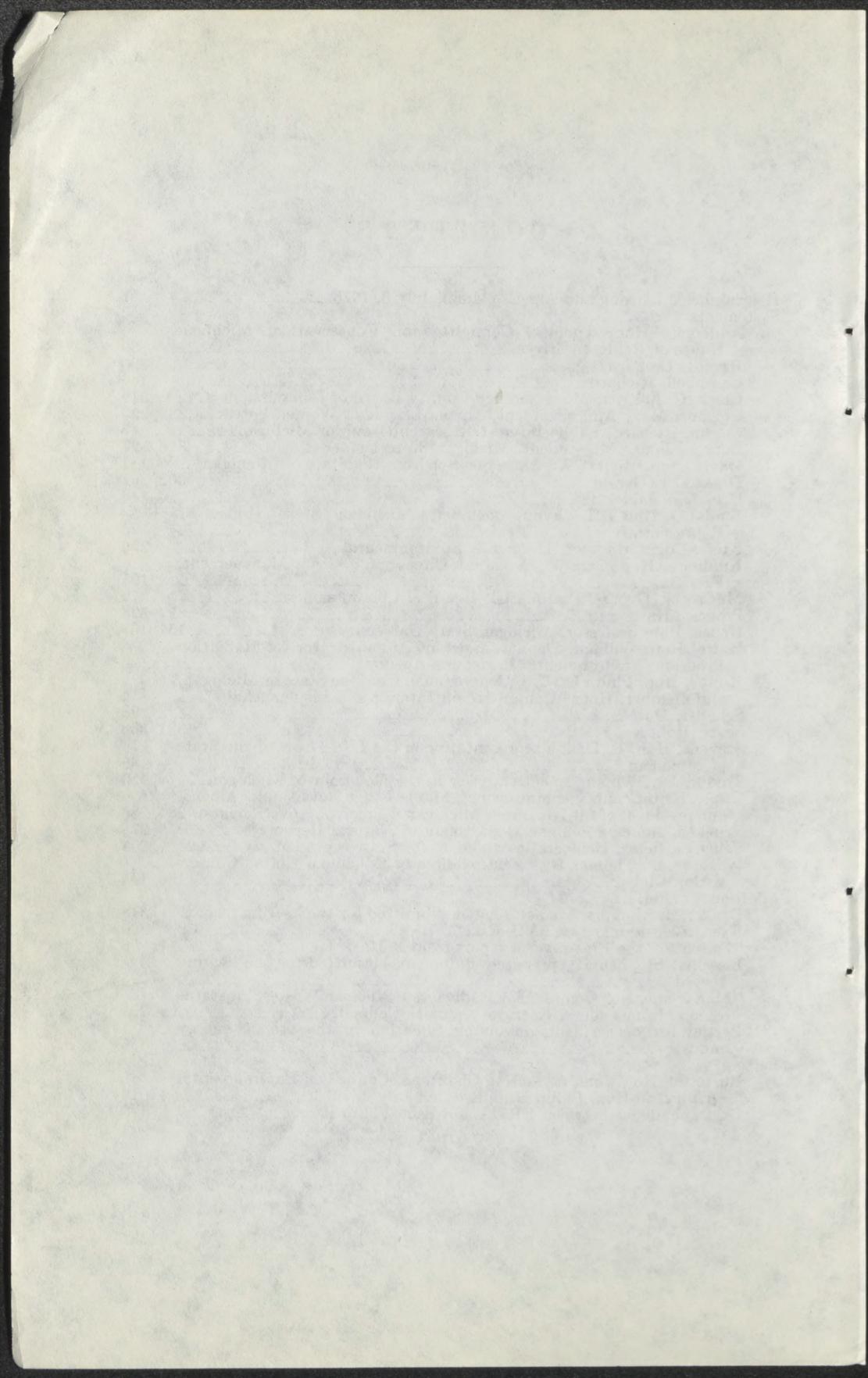
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## NUCLEAR WASTE DISPOSAL IN MICHIGAN

TUESDAY, JULY 6, 1976

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON ENERGY AND THE ENVIRONMENT,  
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,  
*Lansing, Mich.*

The subcommittee met at 8:30 a.m., pursuant to notice, in the conference room, Cooley Law Center, Michigan State University, Lansing, Mich., Hon. Bob Carr presiding.

Mr. CARR. I would like to declare this meeting open.

Today's hearing is being held before the House of Representatives Interior and Insular Affairs Subcommittee on Energy and Environment. At the beginning of the current Congress, the House voted to give this panel the authority to investigate all nonmilitary aspects of the Nation's nuclear program. The Subcommittee on Energy and Environment has been active in carrying out this responsibility. We have held numerous hearings in Washington and the subcommittee has convened in locations across the country to get a firsthand grasp on nuclear issues that concern so many of our citizens.

Too often, decisions regarding nuclear power have been made without significant participation by the people who will be affected.

I am glad to be able to bring this congressional forum to my State to shed some light on the topic before the subcommittee.

Our purpose here today is to discuss the plans of the U.S. Energy Research and Development Administration, known as ERDA, regarding the possible locations of the radioactive waste storage site in the State of Michigan. We intend to use this opportunity to make clear to Federal officials that the interests of the people who might be near the radioactive waste storage sites must be adequately protected. We want to make sure that both the citizens of Michigan and their elected representatives will be able to participate in a significant fashion in any discussion to locate a radioactive waste storage site in this State.

Moreover, we are entitled to know that we will be able to participate in discussions regarding the management of any waste storage site and have priority in the settling of the questions as to whether the storage site will be located in our State.

The immediate reason for this hearing is the recent ERDA decision to conduct test drilling in the lower peninsula. This drilling is planned in order to obtain geological information necessary to determine the suitability of this area for radioactive waste storage.

Considerable concern resulted from ERDA's having made plans to conduct the test drilling without informing the people of the State of Michigan or their concerned representatives at both the State and Federal levels.

Today's hearing will demonstrate that the people have an intense interest in what is going on in their State, they want to understand the technological basis for selecting waste storage sites and they want to know who is in charge of the selection and operation of the sites. They want to know who is making sure that the public health is not placed in jeopardy and they want to understand the Administrative procedures which govern site selection and operation.

Today's hearings will be held in two parts. This morning we will hear from Dr. William Taylor, head of the Governor's Task Force on Environment; Mr. Richard Conlin, representing PIRGM, the Public Interest Research Group of Michigan; Dr. William Rowe, Deputy Assistant Administrator for Radiation Programs, U.S. Environmental Protection Agency. We will also receive testimony from Tom Washington, chairman of the Michigan United Conservation Clubs; and Jon Dean, Student Environmental Confederation. We will also hear from interested citizens.

This afternoon, we will be traveling to Alpena, the site of the drillings, to hold the second portion of the hearings and there we will receive testimony from Dr. Baronowski of ERDA, Mr. James Trucken of DNR, and other interested citizens in the local Alpena area.

Before proceeding with Dr. Taylor, I want to welcome you all here and yield to my colleague from the 11th Congressional District in the upper peninsula and Alpena area, Hon. Philip Ruppe.

Mr. RUPPE. Thank you very much, Mr. Chairman. I would like to express my sincere gratitude to you and to our distinguished colleague, Mr. Udall, for setting these hearings in Alpena and Lansing today. These hearings will give the people of Michigan an opportunity, so far denied them by the U.S. Energy Research and Development Administration, to hear for themselves the exact process and plans ERDA has for the disposal of nuclear waste and how they involve Michigan.

Today we will get a look at a small segment of the nuclear power debate in America. Where do we store the wastes which accrue from the production of electricity by nuclear energy and what involvement should the people living next to a disposal site have in determining its location?

I, for one, will do everything I can as northern Michigan's Representative in Congress to assure that the people have a meaningful and significant input into the decisionmaking process. I believe that we are at a crossroads in deciding the future of nuclear-generated electricity in our Nation. We will, in the next few years, have to reach a decision which will affect many generations yet unborn.

However, these decisions will have to be reached by all of us. They cannot successfully be concluded by Congress alone, by executive agencies alone, or by State and local governments by themselves.

Equally important to the decision is how is it reached? To be a fruitful decision, it will have to be discussed openly and debated honestly. Frankly, I have not been impressed that ERDA has attempted to do this. My feeling was affirmed in the method used to look at Michigan as a potential nuclear waste disposal site.

I again would like to thank you for conducting these hearings and I welcome the opportunity to be with you here today.

[Prepared statement of Mr. Ruppe follows:]

Opening Statement of Congressman Philip E. Ruppe  
Hearings before the Subcommittee on Energy and the Environment  
Interior and Insular Affairs Committee  
Alpena -- Lansing, Michigan  
July 6, 1976

Thank you, Mr. Chairman.

Nuclear power generation and the disposal of wastes associated with that process is not an easy issue to discuss within a calm framework.

The recent debate and referendum in California regarding the regulation of nuclear energy highlighted for much of the nation the character, substance and nature of future debate on the development of nuclear power in this country.

The hearings today will look at a small segment of that debate: where do we store the wastes which accrue from the production of electricity by nuclear energy, and what involvement should the people living next to a disposal site have in determining its location?

Mr. Chairman, I wish to express my sincere gratitude to you and to our distinguished colleague from Arizona, Mr. Udall, for scheduling these hearings in Lansing and Alpena today. They will give the people of our state an opportunity so far denied by the U.S. Energy Research and Development Administration.

That is, for the citizens themselves to hear the exact process and plans ERDA has for the disposal of nuclear waste and how they involve Michigan.

If we look at that feature of nuclear power discussion along, then these hearings have already accomplished a great deal. They will bring into the open a discussion which until now has been withheld from the people.

Moreover, I was pleased that ERDA responded favorably to my request for a suspension of test drillings in Alpena, Montmorency and Presque Isle counties until the agency files an environmental assessment on the proposed action.

It was and is my view that an environmental review of ERDA's action is vital before any drilling commences, not afterwards. For this reason, I am also gratified to report that the President's Council on Environmental Quality has agreed at my request to oversee the preparation of and review the environmental assessment prepared by ERDA so as to assure its completeness and quality.

While these hearings have made ERDA more accountable to the people of Michigan, I also believe there are serious and controversial issues we still must examine.

These include such questions as when will decisions be

reached for the disposal of nuclear wastes? Who will be involved in that decision-making process? What structures and what agencies will insure that the people living adjacent to an area selected for nuclear waste disposal are protected? Will officials of the state and local governments be permitted a veto over selection of their land area as a waste disposal facility?

And, will rural areas be selected over urban areas, and, if so, why - if the geologic characteristics of the urban site and the rural site are equally favorable?

I, for one, will do everything I can as Northern Michigan's representative in Congress to insure that the people here have a meaningful and significant input into the decision-making process which may ultimately have a tremendous impact on their communities and perhaps their lives.

It is imperative, in my view, that the people of Northern Michigan be given every opportunity to make their views known not just to the Congress but to the executive agencies involved with preliminary planning for nuclear waste disposal. I seriously question and doubt that the people would have this opportunity if ERDA's plans for Northeastern Lower Michigan were not disclosed by the press at the end of May.

I will also want to know what weight local citizens' wishes as expressed through their locally elected officials

will have in the decisions reached on nuclear waste disposal, not only in Northern Michigan but in any area under consideration.

My own view is that they are the most important people involved in this entire process. It is their land and their future, after all, that will be impacted by nuclear waste disposal and not that of a Washington bureaucracy.

Clearly, this nation and this state are at a crossroads in deciding the future role of nuclear powered electrical energy in our society. We, as a nation, will have to reach decisions in the next few years which will, because of the very nature of nuclear energy, affect many generations yet unborn.

These decisions will have to be reached by all of us. They cannot successfully be concluded by Congress alone, by executive agencies, such as ERDA, alone, or by state and local governments alone. We will all have to develop that policy together, for we all have a vested interest in the outcome of the decision.

As important as that final decision is, however, of equal importance is the method we use to reach the decision. It is my belief there is only one path that will make the ultimate choice a fruitful one. That method involves open discussion and open debate about all alternatives involving every issue of the nuclear power question.

Frankly, I have not been impressed that ERDA has been attempting to do this. This feeling was affirmed in looking into the method by which the agency and a Michigan governmental agency discussed drilling in Michigan for some seven months before deciding to bring the people they serve into the decision-making process.

If this hearing contributes nothing more to the nuclear power debate, it would perform a profound public service by serving notice on the Energy Research and Development Administration and any other agencies involved in nuclear power that the Congress will not tolerate a closed discussion of these issues, or a public left in the dark about a subject which so deeply affects their destiny.

Nuclear waste disposal is the subject of these particular hearings. The subcommittee has spent many months addressing other aspects of nuclear power. I hope the witnesses here today will focus on this question since we have much ground to cover.

I would like to thank you again, Mr. Chairman, for scheduling these hearings so that the people of our state may better learn how this subject involves them.

Before we start, Mr. Chairman, I would ask that letters I initiated with the Council on Environmental Quality and ERDA,

as well as the agencies' responses, be incorporated into the record of this hearing.

Thank you.

Mr. CARR. Thank you, Congressman Ruppe.

Our first witness is here. I have had a chance to chat with him just 1 minute. Dr. William Taylor, will you take the witness chair there and give us your statement.

**STATEMENT OF DR. WILLIAM TAYLOR, SCIENCE ADVISOR TO THE GOVERNOR**

Dr. TAYLOR. Thank you, Congressman Carr.

Mr. CARR. Do you have a prepared statement or are you going to give it verbally?

Dr. TAYLOR. I have a copy of a written statement from the Governor which I can leave with you.

Mr. CARR. All right, without objection, we will have it inserted in the record at this point and you may proceed in any manner that you find convenient for the expression of the views that you represent.

[Document referred to follows:]

Remarks for Bill Taylor  
and Tom Jackson

July 6, 1976  
ERDA Hearings  
Lansing and Alpena

My purpose today is to outline Governor Milliken's views regarding this proposal.

Governor Milliken is pleased that Mr. Barenoski of ERDA was able to meet with his representative in Washington, Mr. Bob Horn, and Congressman Phil Ruppe last Thursday.

The Governor has stated the importance of having preliminary discussions before any commitments are made regarding this very critical problem. While he recognizes the situation we face nationally regarding nuclear waste, he feels strongly that information regarding preliminary testing and future development of a proposed area must be made available to everyone--including local citizenry and governmental units.

The Governor has also made it clear that he believes complete openness must prevail for proposals such as the preliminary geological study for possible sites in three counties of northeastern Michigan for nuclear waste products. The Governor said that before any further negotiations, discussions and/or binding decisions or contracts are made, he must be assured, in writing, that a disposal site would not be determined in Michigan without approval of the State. It is crucial, that the facts be based on scientifically gathered information. Local citizen and governmental input regarding this project are critical elements in the decision making process. Therefore, these issues must be resolved initially and at once.

If these conditions can be resolved, then it is most important that proper lines of contact are determined between ERDA and the State of Michigan which guarantees openness of operations. He also feels that the Michigan Environmental Review Board must actively participate in any and all plans regarding this project.

As you know, the Governor has appointed a Task Force on Nuclear Waste Disposal which I chair.

The Governor believes that ERDA must continue to work with both that Task Force and the Michigan Environmental Review Board.

This dialog must be maintained in order that proper citizen input may be gathered and utilized. Views from the public on this--as in many other matters are most important--in fact, critical to the decision making process.

Although the Governor is encouraged by recent press reports regarding final approval by the state, as of this date he has received no official response from ERDA. We do understand that ERDA is in the process of preparing a response and are hopeful that it is forthcoming in the near future.

The Governor believes that public hearings such as this one and others planned are vital, and also believes, as I stated previously, these very basic questions must be addressed before any approvals and/or permits are issued for any phase of this proposal.



UNITED STATES  
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

SEP 17 1976

Honorable William G. Milliken  
Governor of Michigan  
Lansing, Michigan 48903

Dear Governor Milliken:

Thank you for your letter of July 8 concerning the disposal of nuclear wastes. I agree with you that the views of the local citizens and governments are crucial factors in the final decision-making process.

As you know, ERDA has been assigned the responsibility to find and develop safe nuclear waste repository sites and Congress has strongly supported this effort. This program is essential if nuclear power is going to assist in meeting our Nation's energy needs. Approximately 45 states contain potentially appropriate geological formations. Full state participation is essential to the important and complex assignment of locating specific candidate sites for repositories.

I appreciate the arrangement made by your office to have the Michigan Environmental Review Board and Nuclear Waste Disposal Task Force meet with my staff on July 26 to review our waste program. Since we have not selected a repository site, it is important to establish a mechanism to bring to these states our thoughts and plans on the overall program leading to a limited number of acceptable sites within the country.

In discharging our Federal responsibility we are also mindful of the equally important responsibilities of state officials. Therefore, your participation and the participation of the Governors of the other states being studied is essential in decisions leading to the final selection of nuclear waste repository sites.

To enable us to fulfil our joint responsibilities, Federal and State Governments must agree on appropriate and workable procedures for determining the acceptability of potential sites for the deep geological isolation of radioactive wastes. The State will participate in the development of the review procedures. These procedures will include the development of the selection criteria for waste repository sites. It is ERDA's position that the project will be terminated in Michigan if the State raises issues on the project connected with these criteria, and their application, that are not resolved through a mutually-acceptable procedure.

Of course, the eventual development of a waste disposal site will be contingent upon full compliance by ERDA with the National Environmental Policy Act (NEPA) and other applicable laws. Development will also be contingent upon approval of funding by the Congress. All of the above reviews will be followed by the need for ERDA to obtain a license from the Nuclear Regulatory Commission (NRC) with another opportunity for full public participation at that time.

I appreciated hearing from you on this important matter and if this procedure meets with your approval, I look forward to working with you in the same spirit of cooperation and accommodation that has characterized the relationship of ERDA and the State of Michigan in the past.

Sincerely,

/s/ Robert Seamans

Robert C. Seamans, Jr.  
Administrator

Dr. TAYLOR. Thank you, Congressman.

My purpose today is to briefly outline Governor Milliken's views regarding the study of potential areas for disposal of radioactive wastes at sites in Michigan. Governor Milliken's office through arrangements with Mr. Baronowski of ERDA was able to meet with his representative in Washington, Mr. Bob Horne, and Congressman Philip Ruppe last Thursday and it was stated that they will be here in Lansing this Thursday to meet with the State Task Force on Nuclear Waste.

The Governor has stated the importance of having preliminary discussions before any commitments are made regarding this very critical problem. While he recognizes the situation we face nationally regarding nuclear waste, he feels strongly that information regarding preliminary testing and future development of the proposed area must be made available to everybody including local citizenry and governmental units.

The Governor has made it clear that he believes complete openness must prevail for proposals such as the preliminary geological study for possible sites in the three counties in northeastern Michigan. The Governor said that before that any further negotiations, discussions and/or binding decisions or contracts be made, he must be assured in writing that a disposal site would not be determined in Michigan without approval of the State.

It is crucial that the facts be based on scientifically gathered information. Local citizen and governmental input regarding this problem are critical elements in the decisionmaking process in Michigan.

Therefore, these issues must be resolved prior to any further action by ERDA or others to study potential sites in Michigan.

If these conditions can be resolved, then it is most important that proper lines of contact between ERDA and the State of Michigan guarantee openness of operation. He feels that the Michigan Environmental Review Board, as our EPA in the State, must actively participate in any and all plans regarding this progress.

As Congressman Carr mentioned, the Governor has appointed a task force for nuclear waste disposal which I chair. Between our task force and the Michigan Environmental Review Board, we will continue to work with ERDA to discuss the probability of sites initiative. The dialog must be maintained in order that proper citizen input may be gathered and utilized. The views of the public on this, and many other factors, are most important, and, in fact, critical to the decisionmaking process.

The Governor is encouraged by recent press reports regarding final approval by the State, particularly from Mr. Baronowski, but as of this date, he has not received an official response from ERDA stating that he has veto authority. We do understand that ERDA is in the process of preparing such a response and are hopeful that it is forthcoming in the near future.

The Governor believes that public hearings such as this one and others planned are vital and also believes, as I stated previously, these very basic questions must be addressed before any approvals or permits are issued for any phase of this proposal.

Thank you.

Mr. CARR. Thank you, Dr. Taylor.

Congressman Ruppe, do you have any questions?

Mr. RUPPE. Thank you very much, Mr. Chairman.

I gather then that at the present time you are not in contact with ERDA or its representatives regarding further work by ERDA on a disposal site within our State?

Dr. TAYLOR. Only in a briefing form. Mr. Baronowski is coming here Thursday to meet with our task force to brief us on the entire nuclear cycle and nuclear waste in general.

The Governor has indicated he wants no more negotiations for drilling permits, et cetera, until we have veto authority.

Mr. RUPPE. My initial understanding from ERDA was that drilling was supposed to have been started in the Alpena-Presque Isle-Montmorency County area in June, last month. I gather then that because of my inquiry, this proposed drilling did not take place and will not take place, at least in the Governor's opinion, until his ability to veto further work is acknowledged by ERDA?

Dr. TAYLOR. That is right, that is correct.

Mr. RUPPE. So the drilling not only has been canceled, but there is no immediate commitment to drill at any specific time; is that correct?

Dr. TAYLOR. That is correct.

Mr. RUPPE. And the Governor is hopeful of getting—you indicate the Governor is hopeful of getting veto power in this area. My understanding in talking with officials of ERDA is that at this moment, certainly they have given no indication that a veto power would be granted.

Have you any assurances or reassurances in that particular area?

Dr. TAYLOR. We only have a statement made by Mr. Baronowski in Chicago a couple weeks ago indicating that they would not select a site in Michigan without the approval of the State of Michigan. He didn't specifically state veto authority, but he did indicate they would not come to Michigan without our approval.

We have been in contact with their office regarding the progress on the Governor's written request for a written veto and they indicated that they are preparing such a statement.

Mr. RUPPE. In ERDA's letter in response to my initial inquiry as to why they selected Michigan, they talk in terms of certain geological information being missing in the Montmorency, Alpena, and Presque Isle County areas. Do you have any idea whether that area of the State has not been mapped as well as other portions of the State? Can you tell me whether there is any shortage of geological data there in comparison with other portions of the same salt-shield?

Dr. TAYLOR. I could tell you what we learned from our geological survey. This is not information from them. Our indication is there has not been the same degree of mining operation in that area as

there are in, say, the more western part of the same saltbed. Therefore, there are not as many mine shafts and, therefore, we don't know quite as much about the thickness of the saltshield in that area.

Mr. RUPPE. Do you know if this is the only area in Michigan that has been suggested by ERDA as a place for test drilling and presumably as a potential site for nuclear disposal?

Dr. TAYLOR. To our information, that is the only site.

Mr. RUPPE. What I don't understand is why ERDA would pick the one portion of the State and one portion of that shield, where there is no information, as the most likely spot for the nuclear disposal area when presumably they have a great deal of the rest of the State and a wide range of area within this particular shield available to them, not only for study, but presumably for testing and even for disposal of nuclear materials.

Dr. TAYLOR. I certainly concur with that statement.

As I indicated, we are having a briefing from ERDA on Thursday and we propose to ask the same kind of questions. We don't know that yet.

Mr. RUPPE. It would seem to me they wouldn't look to an area for a potential site where the geological information is not known, and it brings to my mind a question as to whether they indeed simply looked at the northernmost or remotest section of that shield for their potential disposal site and not looked at it in terms of that area having any particular or unique significance by itself for this particular purpose.

Dr. TAYLOR. We did have an indication from ERDA as to some of the criterion necessary and they included a relatively low population density—talking relative to Detroit, for example; the salt formations must be between 2,500 and 3,000 feet deep, and we do have enough information on that area to know that that is where the salt deposit lies around the Alpena Presque area.

Mr. RUPPE. But they did talk to you in terms of a low population area?

Dr. TAYLOR. Yes.

Mr. RUPPE. Because I had asked them in a rather jocular vein as to why they simply didn't pick something close to the nuclear generating plant, perhaps under the Renaissance Center, something of that nature and they did not offer any suggestion that population sparsity was a key consideration. But I gather it must be in view of the fact they have selected an area which they know absolutely nothing about.

Mr. Chairman, I would take 1 more minute. I have a letter here from acting Chairman of the President's Council on Environmental Quality, John Busterud, and I would like to read a portion of this letter which is dated July 2.

DEAR MR. RUPPE,

Thank you for your recent letter concerning the Energy Research and Development Administration's, ERDA's, proposed test drilling project in the

State of Michigan. I share your concern that ERDA take appropriate steps to assess environmental impacts before any test drilling is begun and keep the public fully informed of the Federal Government's plans for seeking a solution to radioactive waste management problems.

Since receiving your request, our staff has been in contact with ERDA's representatives concerning the proposed Michigan drilling project.

Briefly, we established that although ERDA's existing regulations for implementing the National Environmental Policy Act provide for an environmental assessment to determine whether or not a full environmental impact statement will be written, no such assessment has been initiated.

Your inquiry thus, was both timely and responsible for suspending drilling plans until an assessment is made. We recommended that ERDA adopt an approach which would apply not only to the problem at hand but to future proposals of this nature. We support the approach that was outlined in Mr. Frank Baronowski's letter of June 22, 1976 to you.

Briefly, ERDA will conduct a careful environmental assessment of test drilling in Michigan and no drilling will be undertaken before this assessment is completed. When the assessment is completed, a decision will be made as to whether or not a full environmental impact statement is required. The council intends to review the assessment carefully.

I wish to thank you and members of your staff for calling this matter to our attention.

[Complete letter to follow.]

EXECUTIVE OFFICE OF THE PRESIDENT  
COUNCIL ON ENVIRONMENTAL QUALITY  
722 JACKSON PLACE, N. W.  
WASHINGTON, D. C. 20006

July 2, 1976

Dear Mr. Ruppe:

Thank you for your recent letter concerning the Energy Research and Development Administration's (ERDA) proposed test drilling project in the State of Michigan. I share your concern that ERDA take appropriate steps to assess environmental impacts before any test drilling is begun and keep the public fully informed of the Federal Government's plans for seeking a solution to radioactive waste management problems.

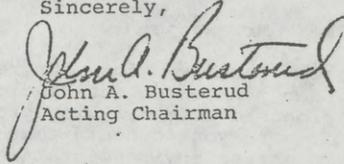
Since receiving your request our staff has been in contact with ERDA representatives concerning the proposed Michigan drilling project. Briefly, we established that although ERDA's existing regulations for implementing the National Environmental Policy Act (NEPA) provide for an environmental assessment to determine whether or not a full environmental impact statement will be written, no such assessment had been initiated. Your inquiry thus was both timely and responsible for suspending drilling plans until an assessment is made.

We recommended that ERDA adopt an approach which would apply not only to the problem at hand but to future proposals of this nature. We support the approach that was outlined in Mr. Frank Baranowski's letter of June 22, 1976 to you. Briefly, ERDA will conduct a careful environmental assessment of test drilling in Michigan and no

Drilling will be undertaken before this assessment is completed. When the assessment is completed, a decision will be made as to whether or not a full environmental impact statement is required. The Council intends to review the assessment carefully.

I wish to thank you and members of your staff for calling this matter to our attention.

Sincerely,



John A. Busterud  
Acting Chairman

Honorable Philip E. Ruppe  
U.S. Congress  
House of Representatives  
Washington, D.C. 20515

bc: Mr. Joseph Kearney, OMB  
Dr. James Liverman, ERDA  
✓ Dr. Richard Roberts, ERDA

The CEQ people in effect have indicated that ERDA was not carrying out its own internal requirements in not undertaking an environmental assessment prior to any proposed drilling. The drilling would have been undertaken in June had we not stopped them.

Could you tell me, Dr. Taylor, whether the State of Michigan has any requirement for an environmental assessment before a program like this would be undertaken?

Dr. TAYLOR. Well, we have a permit requirement from the Department of Natural Resources and the rules regarding the permit are really pretty much up to DNR.

We are currently looking at the question of whether a full environmental impact statement on the ultimate use of the wells might be necessary prior to the issuing of the permit for even a test facility.

Mr. RUPPE. Was any permit extended by the DNR for test drilling, the drilling which would have been initiated in June?

Dr. TAYLOR. That has been withheld until we have a written veto for the Governor.

Mr. RUPPE. Was it ever granted?

Dr. TAYLOR. Not to my knowledge.

Mr. RUPPE. Thank you, Mr. Chairman.

Mr. CARR. Dr. Taylor, I would like you to tell me a little bit about your task force. When was it created and who are the members?

Dr. TAYLOR. We were created approximately a month ago now by the Governor and asked to report to him on recommendations regarding potential use of Michigan as a nuclear waste disposal site by mid-September. We have on our task force, nine members, five of which are State employees from various State offices and four are university faculty members knowledgeable about some phase of nuclear energy.

Mr. CARR. Would you supply a list of members to us?

Mr. TAYLOR. I will.

[Document referred to follows:]

Executive Office  
May 27, 1976

Gov. William G. Milliken Thursday announced the establishment of a nine-member task force to study nuclear waste disposal in Michigan.

"The Nuclear Waste Disposal Task Force will provide factual information in several critical areas," Milliken said. "If the people of Michigan are to make rational choices concerning the future of nuclear power in this state, we need to answer the questions of what types and volumes of wastes will be generated by present and planned reactors, and how should these wastes be transported and stored. We need to know what the alternatives are to nuclear power and what these alternatives will cost."

Milliken said these questions will be addressed from the perspective of health and environmental safety and the ability of utilities to provide electric service to Michigan users. The Nuclear Waste Disposal Task Force will work closely with the Michigan Environmental Review Board on the report. The Task Force's report is due September 15, 1976.

The Governor also is asking the Task Force for an immediate review of the federal government's proposal for a geological evaluation of possible disposal sites in Michigan.

Dr. William G. Taylor, 1424 Cedarhill, East Lansing, Chairman, Department of Civil and Sanitary Engineering at Michigan State University, was appointed to serve as Chairman of the Task Force.

Others appointed for terms expiring at the pleasure of the Governor were:

- X --Michael A. Dively, director of the Michigan Energy Administration;
- Donald Van Farowe, 4125 Delta River Drive, Lansing, Chief of the Radiological Health Division for the Department of Public Health;
- Ronald C. Callen, 501 McPherson Avenue, Lansing, Director of Scientific Research and Evaluation, Office of Policy, for the Michigan Public Service Commission;
- Dr. James G. Truchan, 11398 Nixon Road, Grand Ledge, aquatic biologist, Division Permit Coordinator with Water Quality Control Division of the Department of Natural Resources;
- Dr. Bruce W. Wilkinson, 4447 Taccma Boulevard, Okemos, Associate Professor of Chemical Engineering at Michigan State University;
- Dr. Richard Marriott, 18972 Muirland Avenue, Detroit, Professor of Chemical Engineering

and Material Sciences and also Research Institute for Engineering Sciences, College of Engineering at Wayne State University;

--Dr. William Kerr, 2009 Hall, Ann Arbor, Professor of Nuclear Engineering at the University of Michigan; and

--Dr. Harold E. B. Humphrey, 1061 Glenhaven, East Lansing, Environmental Epidemiologist with the Department of Public Health.

"These men have the background and expertise to help answer the questions raised by nuclear power usage. I am confident they will be an asset to planning Michigan's power future," the Governor said.

The appointments do not require Senate confirmation.

# # #

Mr. CARR. Is there a member from the DNR?

Dr. TAYLOR. Yes.

Mr. CARR. From the Michigan Environmental Review Board?

Dr. TAYLOR. Yes.

Mr. CARR. What other departments?

Dr. TAYLOR. Department of public health, public services commission, and the Governor's office, the five of us.

Mr. CARR. Are the members from Michigan Environmental—let me ask you this; how are you proposing to interface with DNR and MERB?

Dr. TAYLOR. DNR has the ultimate authority to issue the permit so they are operating under the direct orders from the Governor that they are not to negotiate or issue permits until we have written veto authority. Our contacts there are through our members of the task force.

The Michigan Environmental Review Board has a slightly different role to play in this in that they will be assessing any environmental assessment statements or environmental impact statements. The Governor has asked our task force to work closely with the Michigan Environmental Review Board and we will have a joint meeting scheduled for July 26, at which time MERB will be providing the task force with a list of environmental questions which they feel must be answered by our task force prior to their being able to assess environmental impact statement. So, we will be working hand in hand with MERB through this evaluation process.

Mr. CARR. Let me ask about that veto. Congressman Ruppe and I have worked closely with the Governor in one other case of gubernatorial vetoes of projects; namely, Project Seafarer. I think you are also involved in that one a little bit.

Dr. TAYLOR. Yes.

Mr. CARR. And I am wondering about the strategy of gubernatorial vetos. From one standpoint and at first blush, they would appear to be a protective device for the citizens of the State of Michigan. On the other hand, being an evenhanded governor, he is also prepared to examine all the scientific evidence and get all the technical advice and that kind of thing. Those of us who deal in this in a day-to-day way have some suspicions about political decisionmakers subtly delegating their authority to scientific decisionmakers.

I am interested that that doesn't happen. I am interested the Governor is going to obtain citizen input and indeed I would recommend to the Governor through you that some provision be made to include in this process hearing from the State legislature.

Have you had any conversations with many that would indicate to us that the legislature is going to be brought into this as well?

Dr. TAYLOR. No, we have not even sat down to discuss the mechanism by which the veto would be exercised if it is granted.

I think your point is well taken, and, as you know, with the Seafarer question in fact specified that a public opinion poll must be held and the people must favor it and that would be a deciding criteria in the Governor's veto provision. I am sure some provisions

for public input and our legislative input will be built into the veto provision on this particular project.

Mr. CARR. As you know, Congressman Ruppe and I have gone to bat in Washington in numerous meetings with the Governor and Mr. Horne in Washington, we have gone to bat to protect the Governor's veto. I am wondering though if we are not—if we are not painting ourselves into a box by saying we will veto it unless we are—unless it is proven to us that these things are safe.

Of course, the people who have the power and money to make this demonstration of safety oftentimes can overwhelm us with information and overwhelm those who would offer some contrary advice.

In the end, I am just a little afraid that political decisionmakers won't be exercising their political responsibility and will end up in a very subtle way delegating that authority to scientific decisionmakers. I think we as politicians and political leaders have to be prepared to look at an expert, scientific expert square in the eye and say on the basis of what you tell me, on the basis of scientific fact, and knowledge, what you say may be true. However, we don't think it is wise. Just because it is a scientific possibility doesn't make it a wise thing to do. We faced that with SST's and nuclear power and nuclear waste disposal and a lot of military decisionmaking. Just because we have the technological capability and we think we know, it doesn't make it wise to do it. And I would go to the Governor, through you, over that caveat.

I would like to see some role for the Michigan State Legislature as well as members of the congressional delegation which Congressman Ruppe and I will be attempting to pull into the decisionmaking process.

I wanted to find out a little bit about your own personal concern. As a key person in this whole operation, what are your own personal concerns about this?

I know you are here today speaking for the Governor but if you can put that responsibility aside for a second while we have you here, can you give us a personal perspective on nuclear waste storage?

Dr. TAYLOR. Well, OK. Our task force just was formed a month ago so we are still in the preliminary stages but, yes, I have some concerns even from my present knowledge and they deal with the possibility of moisture contained in saltbeds, whether or not saltbeds are dry enough for the type of heat which will be dissipated by nuclear waste.

We have concern about the integrity of the saltbeds, whether there are faults, whether there are unknown mine shafts that could cause leakage of the radioactivity from the disposal site to the surface.

We have concerns about the transportation of high-level nuclear waste, nuclear high-level radioactive wastes from the plants to the reprocessing site wherefore the reprocessing site might be and finally to the burial site.

It appears that in our discussion with other States that a nuclear disposal site would probably be constructed in conjunction with a reprocessing operation. If it is reprocessing that means we have a

surface for processing nuclear waste as well as a subsurface operation for disposal of nuclear waste. We are concerned about what the implications of a surface reprocessing plant might be.

We are concerned about the validity of rejecting other disposal alternatives such as the ice sheets or in space. Some of them have been proposed and apparently at least relegated to a lower order of priority by ERDA concerning all the studies that have been necessary to select geological deposits as the best.

Mr. CARR. Is it within the charter of the task force to be concerned about the cost of this program?

Dr. TAYLOR. We will assess that. Our charter is to provide the Governor with the best information that we can, certainly one of the things we would like to inform the Governor on is what the cost of the alternatives are. If cost is the reason we are going to geological burial, then the Governor ought to be aware of that fact.

Mr. CARR. Have you had any information so far about the cost of this program?

Dr. TAYLOR. Well, we have had some statements by ERDA which claim that the cost of disposing of radioactive waste is something like in the order of one-tenth of a mill per kilowatt-hour so it is very minimal compared to the cost of generation. That is for geological disposal.

Mr. CARR. But by their own statements, to me at least, it is still about \$350 million over the next 5 years, not to mention the cost of constructing sites and on into the future.

Well, I hope that the ratepayers of this State understand that, ultimately, they will bear the burden of that kind of thing.

Dr. TAYLOR. Right.

Mr. CARR. Dr. Taylor, your testimony has been very helpful, you have been a fine representative of the Governor and we hope to continue this today along with you as we seek to grope and find our way out of the thing either on this most important issue.

Do you have any further questions?

Mr. RUPPE. No. Thank you very much, Mr. Chairman.

Mr. CARR. All right.

Thank you very much, Dr. Taylor.

Dr. TAYLOR. Thank you, Mr. Chairman.

Mr. CARR. Our next scheduled witness is Hon. H. Lynn Jondahl, the State representative from our home district.

Welcome to this congressional hearing, State Representative Jondahl.

#### STATEMENT OF HON. H. LYNN JONDAHL, MEMBER, MICHIGAN STATE HOUSE OF REPRESENTATIVES

Mr. JONDAHL. Thank you very much. I appreciate the invitation to be here, an invitation to be up and about on Tuesday morning after a holiday. That forces some of the rest of us to be at work.

I have prepared a statement and I want to—

Mr. CARR. Without objection we will enter it into the record and you can proceed in any way you find helpful.

[Prepared statement of H. Lynn Jondahl follows:]

PREPARED STATEMENT OF H. LYNN JONDAHL, MEMBER, MICHIGAN STATE HOUSE OF REPRESENTATIVES, JULY 6, 1976

We citizens of Michigan, as the citizens of every State, remain the subjects enslaved to national energy and, specifically, nuclear policies. Although we might wish to set and enforce standards regarding safe transportation of radioactive waste products, courts have ruled and Attorney General Kelley has held that the transportation of radioactive wastes throughout the State of Michigan will be regulated and monitored by Federal policy—product of the Atomic Energy Act.

The Michigan constitution of 1963 reads—article IV, sections 50 and 51—“SECTION 50. The legislature may provide safety measures and regulate the use of atomic energy and forms of energy developed in the future, having in view the general welfare of the people of this state. The public health and general welfare of the people of the state are hereby declared to be matters of primary public concern. The legislature shall pass suitable laws for the protection and promotion of the public health.” Unfortunately, this constitutional language becomes meaningless in the face of the overpowering prerogatives of the Atomic Energy Act. The practical meaning of this reality can probably be most clearly described by Mr. Conlin of the Public Interest Research Group in Michigan. That organization publishes a report, “Fallout on the Freeway: The Hazards of Transporting Radioactive Wastes in Michigan,” and since that time has worked with State agencies and the legislature in an effort to develop suitable laws for the protection and promotion of the public health as regards the transportation of radioactive wastes.

Although I do not know the power and effect of his statement, I have read in the press that Dr. Robert Seamans, head of the Energy Research and Development Administration—ERDA—has said that nuclear powerplant wastes will not be stored in Michigan “if the people don’t want them there.” His quote. I don’t know whether that represents official policy, a statement in a social conversation, a press release, or an official or unofficial leak. However, it does serve to heighten the policy problem.

That problem is: How do nuclear energy decisions get made? If I had to vote today whether I want to see radioactive wastes stored in Michigan I would be eager to tell Mr. Seamans: “No, we don’t want them here.” However, my vote would not be the product of policy debate, it would be the product of my reaction to another reported statement by Mr. Seamans: “We haven’t got the final answer on how to store the end product, the waste of nuclear power. It would be better if we had that answer in hand. But the technology (nuclear power) is here and working well and it can be tapped immediately.”

Aside from smiling at the contention that nuclear power is here and working well, one also must express awe at the nature of the understatement that: “We haven’t got the final answer on how to store the end product, the waste of nuclear power.” ERDA currently is attempting to investigate nearly 50 radioactive waste disposal sites used 20 or 30 years ago. According to a report in the June 19, 1976, issue of Environmental Action, page 14: “ \* \* \* sites where measurable amounts of radioactivity have been found include two classrooms at Columbia University in New York, where the Manhattan project carried out some of its research; three buildings at the University of Chicago; a National Guard armory and the Billings Hospital, both in Chicago and both former Manhattan project sites; Princeton University, the Massachusetts Institute of Technology, Iowa State University, and the Lawrence Berkeley Laboratory. Also on the list are 23 industrial plants and property at the St. Louis, Mo., airport, where radioactive wastes were buried.

“At one site in the Cook County Forest Preserve near Palos Park, a suburb of Chicago, tritium (a radioactive isotope of hydrogen) was leached into

ground water." The Washington Star quoted Dr. Martin Biles, head of ERDA's Standards and Compliance Division, as saying: "The wastes were found in well water one-half mile away. He added that the radioactivity is not high enough to constitute a health hazard."

In some instances, it is reported, the specific waste deposit locations cannot be identified due to lost, incomplete, or never drafted records. The commitment of a people to the future is not, in a rational and moral society, legitimately left in the hands of unaccountability, private investments, and public and private technological research and development. The reason a commitment to nuclear energy is a policy matter—yet unresolved and, therefore, requiring hesitation on further nuclear development—is made clear in two brief statements.

"Fission energy is safe only if a number of critical devices work as they should, if a number of people in key positions follow all their instructions, if there is no sabotage, no hijacking of the transports, if no reactor fuel processing plant or reprocessing plant or repository anywhere in the world is situated in a region of riots or guerrilla activity, and no revolution or war—even a 'conventional one'—takes place in these regions. The enormous quantities of extremely dangerous material must not get into the hands of ignorant people or desperados. No acts of God can be permitted."—Dr. Hannes Alfvén, Nobel Laureate in Physics, writing in May 1972 Bulletin of the Atomic Scientists.

The second statement, from an article in Science—July 7, 1972—was made by Dr. Alvin Weinberg, Director of the Oak Ridge National Laboratory: "We nuclear people have made a Faustian bargain with society. On the one hand, we offer—in the catalytic burner—an inexhaustible source of energy \* \* \*

"But the price that we demand of society for this magical energy source is both a vigilance and a longevity of our social institutions that we are quite unaccustomed to.

"We make two demands. The first, which I think is easier to manage, is that we exercise in nuclear technology the very best techniques and that we use people of high expertise and purpose. \* \* \*

"The second demand is less clear, and I hope it may prove unnecessary. This is the demand for longevity in human institutions. We have relatively little problem dealing with wastes if we can assure always that there will be intelligent people around to cope with eventualities we have not thought of. If the nuclear parks that I mention are permanent features of our civilization, then we presumably have the social apparatus, and possibly the sites, for dealing with our wastes indefinitely. But even our salt mine may require some surveillance, if only to prevent men in the future from drilling holes into the burial grounds."

We have not achieved the technological answers necessary for us to continue burying these wastes. Perhaps more importantly, we have not resolved the policy problems. I frankly don't know how these problems ultimately will be resolved—but I know of few more immediate agendas. In order to create the social/political order called for in the above citations, we necessarily will have to create public policy mechanisms which will develop policy answers to such questions as: Should radioactive wastes be deposited underground in Michigan? Should radioactive wastes be buried at sea? Should nuclear development continue at full tilt during the time when we haven't got the final answers on how to store the end product?

Perhaps I can make my case more clearly by quoting from a recent letter from a Michigan citizen written, I imagine, in response to Consumers Power Co.'s effort to warn stockholders about the dangers of opposition to nuclear development. The letter to me states, in part: "I am writing you with great concern for the many socialistic practices that are being enforced upon the people of this state and nation by special interest groups and do-gooders. This is both frightening and potentially dangerous—dangerous to the future well-being of our nation and state. \* \* \*

"There are many proposed socialistic bills that are presented each year to the house and senate which, if enacted, would eventually be a complete takeover of private enterprise. Of all the past proposals, none rates any more urgent in need of being rejected than one limiting us in our 'God given right', of being able to have all the advantages of the advancement in technical

knowledge in the nuclear energy field. House Bill No. 5807 is not to the benefit of all our people, but to only a few special interest groups like the Sierra Club and ecology groups."

The terrible irony is that nuclear power development is incredibly and overwhelmingly a product of governmental subsidy. As we come to rely upon it we will be producing an aristocracy of nuclear technicians upon whom we must depend for our most basic of economic and social needs—energy.

Since talking with them, I have been reading with a great deal of interest some of the work of Herman E. Koenig and Thomas C. Edens, faculty persons at Michigan State University. Their concern for future policy is that since nuclear development depends upon the technological expertise of a few, and as nations would depend increasingly upon this technology, those few people would wield enormous controls over governments—over people, their systems, their institutions and politics.

According to A Status Report on Management of Commercial Radioactive Nuclear Wastes, dated May 10, 1976, and published by the Federal Energy Resources Council, chaired by Elliot Richardson: "The Federal Government has accepted the responsibility for assuring the safe and environmentally sound management of nuclear wastes. This objective is being fulfilled through a recently accelerated, comprehensive government waste program plan calling for: Extensive environmental assessments and impact statements, prior to decisions on reprocessing, recycle, waste forms, storage modes, and packaging criteria; selection of specific technologies for waste solidification; selection and qualification of waste terminal storage sites; demonstration and completion of technical development for commercial scale operations; completion of environmental, safety, and related regulatory standards, criteria and reviews to assure acceptable radioactive waste management practices; an interagency task force to coordinate these activities among the responsible federal agencies.

The program is scheduled to satisfy the need for waste terminal storage facilities in a timely manner.

Missing from this outline is any indication of how the policy decisions will be made in order to satisfy the citizenry that they are party to the decisions which affect them so directly.

I am proposing, for Michigan, a decisionmaking mechanism/process which will involve public debate prior to decisions regarding nuclear waste disposal. Obviously, from what I already have indicated, it is far from clear whether—or the degree to which—the State of Michigan can play a role in this decision-making. I want to outline the mechanism I am proposing in the hope that it may provide some stimulation for development on the Federal level if we are not able to effect it here.

I am proposing that, in Michigan, the construction or enlargement of a nuclear waste disposal facility shall not occur until a certificate of reliability has been obtained from the Public Service Commission and approved by the legislature. The commission may issue a certificate of reliability only after soliciting opinions and information from interested persons and only if the commission holds widely publicized public hearings at places near the location proposed to be certified as the nuclear waste disposal facility and along routes which will or may be used to transport nuclear wastes to the nuclear waste disposal facility.

The commission may issue a certificate of reliability upon its finding, based solely upon information presented at the public hearings that: (A) Any limits imposed by Federal law on the liability for nuclear harm caused during the transportation or storage of the nuclear wastes are waived and full compensation for nuclear harm is assured; (B) the nuclear wastes can be transported to the facility and stored or disposed of with no reasonable possibility of endangering the health, safety, and welfare of the people of the State of Michigan by intentional or unintentional diversion of the wastes into the natural environment in excess of standards set by proper authorities and accepted by the commission as adequate, due to imperfect storage technologies, or containment, or transportation techniques, acts of God, theft, sabotage, governmental or social instabilities, or whatever other causes the commission deems reasonably possible, for any period during which the wastes are radioactive or toxic.

My intent, obviously, is to stimulate and expand the debate, more than 30 years overdue, regarding the creation of public policy in the commitment to nuclear energy production, distribution, and use.

Have the people of this State made a nuclear policy decision? Yes, in the 1963 constitution. That is the extent of the people having spoken. The stakes are substantial. There are serious differences of opinion among citizens and experts regarding the safe use of civilian nuclear fission powerplants related to the safety and environmental hazards associated with the entire nuclear fuel cycle compared with benefits derived from the civilian nuclear powerplants. The economic effect of a commitment to nuclear fission powerplants, particularly in relation to long-term cost and availability of raw materials and the costs of all necessary safeguards, also relate to the central question of proliferation of nuclear fission powerplants in comparison to possible alternatives.

These are energy policy concerns and are legitimately the concerns of the people of this State and Nation. If we continue nuclear power expansion as we have done to date, these concerns become irrelevant and the only relevant concern is: How do we live with the risk? How do we live with the Faustian bargain with society made by the nuclear people?

Michigan's constitution is clear—although it may be irrelevant under the overriding power of the Atomic Energy Act—in asserting that burial of nuclear waste in Michigan cannot be approved until the elected representatives of the people can assume their constitutional responsibility to provide safety measures and regulate the use of atomic energy and forms of energy developed in the future, having in view the general welfare of the people of this State.

Mr. JONDAHL. My name is Lynn Jondahl and I live in East Lansing. I am a representative in the Michigan House of Representatives from the 59th district. I chair the House Consumers Committee and am a member of the Special House Committee to Study and Evaluate the Effectiveness of the Michigan Public Services Commission which has just carried on a yearlong study of nuclear powerplants in Michigan.

I am also sponsor of H.B. 5807, a bill which proposes a 5-year moratorium on the Department of Nuclear Fission Power Plants in Michigan.

Therefore, I am vitally interested in the matter you are considering here today. Our energy policies in this State and in this Nation are important to every citizen. Because production of energy and energy distribution is so essential to live in a developed society, energy policy is a political matter of primary significance. Others here today, better than I, can discuss the technology of energy production, distribution, and use. But I want to discuss matters of policy.

We citizens of Michigan, as the citizens of every State, remain the subjects enslaved to national energy and, specifically, nuclear policies. Although we might wish to set and enforce standards regarding safe transportation of radioactive waste products, courts have ruled and Attorney General Kelley has held that the transportation of radioactive wastes throughout the State of Michigan will be regulated and monitored by Federal policy—product of the Atomic Energy Act.

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I think I may want to question him about that story.

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The second demand is less clear, and I hope it may prove unnecessary. This is the demand for longevity in human institutions. We have relatively little problem dealing with wastes if we can assure always that there will be intelligent people around to cope with eventualities we have not thought of. If the nuclear parks that I mention are permanent features of our civilization, then we presumably have the social apparatus, and possibly the sites, for dealing with our wastes indefinitely. But even our salt mine may require some surveillance if only to prevent men in the future from drilling holes into the burial grounds.

I end the quote there but I cite in my testimony the statement he makes that we go on the incredible mechanism we have set up in the military nuclear to protect ourselves from any unwanted release of that, saying that, in fact, probably peaceful nuclear energy probably will make demands of the same sort in our society probably of longer durations.

We have not achieved the technological answers necessary for us to continue burying these wastes. Perhaps more importantly, we have not resolved the policy problems. I frankly don't know how these problems ultimately will be resolved—but I know of few more immediate agendas. In order to create the social, economic, political order called for in the above citations we necessarily will have to create public policy mechanisms which will develop policy answers to such questions as: Should radioactive wastes be deposited underground in Michigan? Should radioactive wastes be buried at sea? Should nuclear development continue at full tilt during the time when we haven't got the final answers on how to store the end product?

Perhaps I can make my case more clearly by quoting from a recent letter from a Michigan citizen written, I imagine, in response to Consumers Power Co. effort to warn stockholders about the dangers of opposition to nuclear development. The letter to me states, in part:

I am writing you with great concern for the many socialistic practices that are being enforced upon the people of this State and Nation by special interest groups and do-gooders. This is both frightening and potentially dangerous—dangerous to the future wellbeing of our Nation and State . . .

There are many proposed socialistic bills that are presented each year to the House and Senate which, if enacted, would eventually be a complete takeover of private enterprise. Of all the past proposals, none rates any more urgent in need of being rejected than one limiting us in our God given right of being able to have all the advantages of the advancement in technical knowledge in the nuclear energy field. House bill No. 5807 is not to the benefit of all our people, but to only a few special interest groups like the Sierra Club and ecology groups.

The terrible irony is that nuclear power development is incredibly and overwhelmingly a product of governmental subsidy. As we come to rely upon it, we will be producing an aristocracy of nuclear technicians upon whom we must depend for our most basic of economic and social needs—energy.

Since talking with them, I have been reading with a great deal of interest, some of the work of Herman E. Koenig and Thomas C. Edens, faculty persons at Michigan State University. Their concern for future policy is that since nuclear development depends upon the technological expertise of a few, and as nations would depend increasingly upon this technology, those few people would wield enormous controls over governments—over people, their systems, their institutions and politics.

According to "A Status Report" on "Management of Commercial Radioactive Nuclear Wastes", dated May 10, 1976, and published by the Federal Energy Resources Council, chaired by Elliot Richardson,—this spelled out the background and research and so on that must be done in order for the decisions to be made regarding removal and disposal of nuclear radioactive wastes.

Listed out in the statement that I have cited in my testimony are the various problems that have to be addressed. But missing from that outline all together and from that statement all together is any indication of how the policy decisions will be made in order to save the citizenry that they are party to the decisions which effect them so directly.

I am proposing for Michigan, a decisionmaking process which will involve public debate prior to decisions regarding nuclear waste disposal. Obviously, from what I already have indicated, it is far from clear whether—or the degree to which—the State of Michigan can play a role in this decisionmaking. I want to outline the mechanism I am proposing in the hope that it may provide some stimulation for development on the Federal level if we are not able to effect it here.

I am proposing that, in Michigan, the construction or enlargement of a nuclear waste disposal facility shall not occur until a certificate of reliability has been obtained from the Public Service Commission

and approved by the legislature. The commission may issue a certificate of reliability only after soliciting opinions and information from interested persons and only if the commission holds widely publicized public hearings at places near the location proposed to be certified as the nuclear waste disposal facility and along routes which will or may be used to transport nuclear wastes to the nuclear waste disposal facility.

The commission may issue a certificate of reliability upon its finding, based solely upon information presented at the public hearings that: (a) Any limits imposed by Federal law on the liability for nuclear harm caused during the transportation or storage of the nuclear wastes are waived and full compensation for nuclear harm is assured. (b) The nuclear wastes can be transported to the facility and stored or disposed of with no reasonable possibility of endangering the health, safety, and welfare of the people of the State of Michigan by intentional or unintentional diversion of the wastes into the natural environment in excess of standards set by proper authorities and accepted by the commission as adequate, due to imperfect storage technologies or containment or transportation techniques, acts of God, theft, sabotage, governmental or social instabilities, or whatever other causes the commission deems reasonable possible, for any period during which the wastes are radioactive or toxic.

My intent, obviously, is to stimulate and expand the debate, more than 30 years overdue, regarding the creation of public policy in the commitment to nuclear energy production, distribution and use.

Have the people of this State made a nuclear policy decision? Yes, in the 1963 constitution. That is the extent of the people having spoken. The stakes are substantial. There are serious differences of opinion among citizens and experts regarding the safe use of civilian nuclear fission powerplants related to the safety and environmental hazards associated with the entire nuclear fuel cycle compared with benefits derived from the civilian nuclear powerplants. The economic effect of a commitment to nuclear fission powerplants, particularly in relation to long term cost and availability of raw materials and the costs of all necessary safeguards, also relate to the central question of proliferation of nuclear fission powerplants in comparison to possible alternatives.

These are energy policy concerns and are legitimately the concerns of the people of this State and Nation. If we continue nuclear power expansion as we have done to date, these concerns become irrelevant and the only relevant concern is: "How do we live with the risk? How do we live with the Faustian bargain with society made by the nuclear people?"

Michigan's constitution is clear—although it may be irrelevant under the overriding power of the Atomic Energy Act—in asserting that burial of nuclear waste in Michigan cannot be approved until the elected representatives of the people can assume their constitutional responsibility to provide safety measures and regulate the use of atomic energy and forms of energy developed in the future, having in view the general welfare of the people of this State.

That citation is from the constitution again.

Thank you, Mr. Chairman.

Mr. CARR. Thank you, Representative Jondahl, that was an extremely fine statement, very thoughtful, and I know you to be a very thoughtful person and eloquent spokesman for the point of view you stated.

Let me respond first by just saying that the Atomic Energy Act is a frustration for those of us in Congress as well. While this committee has general oversight on nonmilitary nuclear policy, we don't have any legislative jurisdiction. The legislative jurisdiction in the Congress resides with the Joint Atomic Committee.

That committee is made up of those, same nuclear people you talk of. What we have to do in the Congress is some committee reform to make sure that other kinds of nonnuclear concerns have voices on those legislative committees. It is extremely frustrating for us.

Let me proceed, also, before turning the—yielding to my colleague.

You were in the room, I believe, when I was having my dialog with Dr. Taylor about the so-called veto power of the Governor of Michigan over the site selection here in Michigan.

Perhaps you would like to respond as a member of the State legislature, as someone who is concerned and knowledgeable in this area about what the legislature might want to see in the pattern of veto decisionmaking in the State of Michigan.

Mr. JONDAHL. Yes, I appreciated your raising the question you did because I think it is very directly related to the concerns I have.

We have before us in the legislature, a bill introduced and I am sure you will hear more about it this afternoon, Senator Davis has introduced a bill that essentially would require an executive order from the Governor authorizing the nuclear waste deposits in the State, that it would maintain, however, that prerogative within the Governor's office.

From my perspective, that is illegitimate in terms of the prerogatives of the legislature having been ignored.

What we need, I believe, is consistency with the constitutional provisions, that is the State constitutional provisions, that is legislative decisionmaking in regard to nuclear and atomic energy policy. We have not had that.

For two reasons, essentially, one, being obviously the frustrations with our own prerogatives in regard to competing with the Atomic Energy Act. But the other being that we have not figured out yet how to inject ourselves into that decisionmaking and my hope is that concerns such as the ones this committee is pursuing will stimulate the legislature to see that we do have need for addressing that issue. That is why I would rather see us go through the legislative process and require legislative approval in the proposal which I am putting forth, it would require a two-thirds vote of each House in order for authorization for deposit of nuclear wastes.

That, to me, seems appropriately within the context of the constitutional language and appropriately within the context of my understanding of nuclear energy being such a basic policy issue because it so dramatically affect all aspects of our lives.

Mr. CARR. Well, I hope you have some success because, as I indicated before, I think that sometimes this veto thing done for the

purest of motives can end up painting us into a box if, or into a corner, if we don't make sure that that process is deliberate and really does what it promises to do and enabling the elected representatives—and the Governor is a fine person and I know him to be a thoughtful person but he is only one elected representative of the State of Michigan—to make the decision. I am interested that some of the other branches of the government also have participation, too—participatory rights in this veto process. I am hopeful that the legislature would speak out against a piece of the action in that regard.

Mr. JONDAHL. If the only issue were one of yes or no on the deposit of nuclear waste, then I would be a little more nonchalant about who made that decision and if it were to be the Governor and if that is the way things shape up, and so on, but my concern is the broader question as well and that is the process we set up whereby that decision gets made because that process, if it doesn't incorporate the concerns of the people through their elected representatives, I think will serve to frustrate us in the long run.

Mr. CARR. To facilitate the idea that the State and Federal Government, particularly the Congress and legislature ought to work together on common problems, can you tell us if the State legislature is proposing hearings such as we are having on this particular subject?

Mr. JONDAHL. To my knowledge, none have been scheduled. The bill of Senator Davis, I think, was introduced and has received no committee action to this point although you will want to push that further with him but that is my undersanding.

Mr. CARR. Senator Davis will be testifying this afternoon, yes.

Mr. JONDAHL. They are having a series of hearings over the past 3 or 4 years regarding various aspects of transportation of radioactive waste which is immediately relevant to the issue you are concerned about; legislation introduced and again Mr. Conlin is, I think, more on top of that regarding transportation. Legislation was pursued, redrafted, and so on, in regard to that under a subcommittee of the Public Health Committee of the House in the legislature. Those concerns have been pursued but again face the frustration most recently of the Attorney General's opinion indicating that it is not the prerogative of the State to regulate or set standards for transportation of radioactive wastes.

Mr. CARR. As one member of the Energy and Environmental Subcommittee, I want to let you know and your colleagues in the legislature, we are interested in working with you in tandem and coordinate our efforts in trying to sort out this most important problem.

You obviously believe the AEC Act should be revised as we do believe, and we would be glad to receive your specific recommendations regarding how you might see that modification shape up.

Mr. JONDAHL. Thank you.

Mr. CARR. So that we might be able to pursue that in Washington. Congressman Ruppe?

Mr. RUPPE. Thank you very much, Mr. Chairman.

I think you have given an excellent piece of testimony and I think you hit a key point, that is just how are these policy decisions going to be made?

I have had a chance to read the same report by Secretary Richardson that you have read, and he does outline within that report issued on May 10 of this year the various responsibilities of Government agencies. He defines the role that ERDA would have in the development of environmentally safe waste management technology, the role that the Nuclear Regulatory Commission would have in establishing safe and environmentally sound standards and criteria; he goes on to indicate the role of the U.S. Geological Survey, the role of the Environmental Protection Agency in establishing general environmental standards which must be met in conjunction with waste activities.

However, the key decision is really how those policy decisions are going to be made. It will be very interesting to see how the State of Michigan and ERDA resolves that particular question because there is, in my mind, a very fundamental decision to be made. Does the public decide? Granted, they should be and must be involved. Their local government officials certainly should have a complete understanding of what any Federal and certainly State agency would intend in their respective areas. The Governor and legislature both want and desire a role, but I don't think the role of the State as yet is defined because I have again this letter received from Mr. Baronowski, dated June 22, and in it, I would like to emphasize, he comments in several areas. For instance, he does say "We do plan to increase State involvement if the program does go beyond the study phase."

And in another paragraph he said:

We will conform with all applicable State statutes including the National Environmental Policy Act and title 4 of the Intergovernmental Cooperation Act of 1965 as implemented by the Office of Management and Budget Circular A-95 which requires that State and local governments be provided with information on projected Federal development to facilitate coordination, and I use the word only, coordination, of State, regional, and local plans and programs.

Again, in a subsequent paragraph:

In the final analysis, Congress makes the decisions on whether a given site should be obtained or utilized for the personal disposal of commercial radioactive wastes by virtue of its allocation of funds or the conditions under which it authorizes those funds to be expended.

So, Mr. Baronowski's letter to me leaves me somewhat less than sanguine as to whether the elected government, the Governor or legislature, have control over the final answer to be given them as to whether nuclear waste disposal should or should not, as a program, be undertaken in a given State.

Mr. JONDAHL. You used the word "sanguine", I didn't—

Mr. RUPPE. I did that for my colleague here, it just comes naturally in Michigan.

Mr. JONDAHL. That is an example of the frustration that people feel in regard to any given issue as it develops where the decision-making is essentially out of our hands.

On the one hand, I appreciate the technological sophistication of an issue such as nuclear power development. Without question, it is a very sophisticated and esoteric development.

But, if we cannot develop the mechanisms for public control of that kind of technology, then essentially what we have bought is a concentration of expertise which then becomes the controller over public policy. And it is at that point that I think what we are pointing to in a particular example of how do we get rid of nuclear waste becomes a much more substantial question of how do we invest public input of the public into those policy matters?

I wish I had flashing brilliance about how best that could be done but it seems to me that that is a major but not the major agenda item that we have before us.

Mr. RUPPE. If a Federal agency has as much power as we have indicated, and if they have the decisionmaking capability without really having to be concerning themselves with a veto by either the State administration branch of government or the legislature, what we do is we concentrate not only all the expertise within the Federal agency but all the decisionmaking. I think there is a temptation within a Federal agency to use more and more decisionmaking power whenever it is possible to do so because, as I indicated a few months ago, the Council on Environmental Quality has indicated to me that ERDA should have developed an environmental assessment prior to any drilling program. Yet the fact is that they did not—and, as a matter of fact, the requirement for an environmental assessment is, I understand, part of ERDA's internal procedures and requirements. Yet, in this particular case, ERDA has not followed its own requirements and has, before we were involved here, taken the path that an environmental assessment was not necessary and that they simply would go ahead and conduct a drilling program without informing the public, the Governor, or the legislature. They went ahead on their own.

I think it is that grasp of authority within any agency, the desire to unilaterally make this type of decision that bothers me a great deal and I am sure it would you.

Mr. JONDAHL. And it is not unheard of at the State level.

Mr. RUPPE. Thank you, Mr. Chairman.

Thank you for a very good statement.

Mr. CARR. Thank you Representative Jondahl. It was a most impressive statement and our report to Congress will benefit from your presence today.

Mr. JONDAHL. Thank you.

Mr. CARR. At this time, I understand Representative Tom Anderson is in the room.

Representative Tom Anderson is Chair of the State House Committee on Conservation and has been doing yeoman work in that respect. I recall the days I was in the Attorney General's Office, when I was here in the State of Michigan, and Tom Anderson, you may recall, is the author of, along with the chief drafter, Joe Sax, of our famous Michigan Environmental Protection Act known then as 3055.

It is good to see you again, Tom.

STATEMENT OF HON. THOMAS ANDERSON, CHAIRMAN, COMMITTEE  
ON CONSERVATION, MICHIGAN HOUSE OF REPRESENTATIVES

Mr. ANDERSON. Thank you, Mr. Chairman.

Mr. CARR. Do you have a prepared statement or are you going to wing it?

Mr. ANDERSON. No, I do not have a prepared statement.

Gentlemen, I appear before you today with two hats. As you have indicated, Mr. Chairman, I am Thomas J. Anderson, State representative from the 28th District of Michigan. I chair the Michigan House of Representatives Committee on Conservation, Environment, and Recreation. I have been doing so since 1969.

I also, however, appear representing the National Conference of State Legislature, from which I chair the Committee on Science and Technology. I have done so since 1970.

I wish to make a few brief remarks today in the general context about the concerns that we in the legislative business feel for what is going on in the announcement that Michigan has been selected as a possible and potential site.

I want to express a concern that all of us in the legislative business feel and many citizens feel that the Congress and Mr. Ruppe who represents the area that would be used for such deposits, was brought late into the discussions and so I wish to—

Mr. CARR. He almost forced his way in.

Mr. RUPPE. I wasn't requested, I would say that.

Mr. Anderson. I recognize that Mr. Ruppe had to be firm in being considered as a Congressman of the area affected, and I commend you, Mr. Chairman, and the subcommittee, for the action that is being taken here. I applaud the decision that has been made even though late for the obtaining of local information for bringing the matter to the public. I think the action, although late, I want to express again, has come up nevertheless with a commendable idea in bringing this matter to the people and then I commend also your subcommittee in being instrumental in exploring this concept here in Michigan.

I have been concerned for a long time with the former Atomic Energy Commission's and presently ERDA's reluctance to level with the people. I think everybody in the legislative business and all those in society who recognize that the business of nuclear science, the use of nuclear power, the promulgation of and proliferation of radioactive elements and their use in our society are fraught with dangers.

The public is concerned primarily and the legislatures of this Nation are concerned primarily because we don't know enough to be certain what is going on and that is why I say that we are concerned about the former AEC policy of containment of information within AEC.

We were concerned as many thinking people were that they were formerly the designers, salesmen, and policemen all at once of the business of nuclear proliferation. Because of this, there has been a lack of credibility among the members of the public about anything radioactive. People have learned to distrust this business of

nuclear science and this business of radioactivity. So, it is in that context that I bring you this message today that this distrust is being expressed in many ways.

You will hear today from persons who I see in the room who have been for sometime now on the scene expressing these concerns.

They are concerns about the transportation of radioactive materials through our State or through any State. I want to say in that regard that I just am not going to bore you with details, I have a report from the library made for the General Assembly of North Carolina on radiation hazards.

I have one here put together by the Southern Interstate Nuclear Board on the transportation of nuclear spent fuel.

I have a comprehensive report prepared for the California Assembly, Nuclear Power Safety in California; and I could go on and on and on because I have access to better than 500 books of this nature directed toward the legislatures of the several States indicating that there is a widespread public concern in this Nation and Michigan is no exception.

Mr. ANDERSON. There is widespread concern as to the proliferation of nuclear power. We have read last year's national reports on the forecasts and proposals and needs of the Nation in regards to energy for the years to come.

We have read that the forecast power supply to be accomplished by nuclear means up to 25 percent nuclear-supplied power by the year 1985. I don't believe there are any of us here who believe they can reach that goal, but surely it is intended to reach 25 or 30 percent in some foreseeable future time, and perhaps by the end of the century.

I don't think we have sufficient information, however, on any of the problems that affect people. We are talking now about looking into Michigan as a possible depository for large quantities of nuclear wastes.

I am quick to recognize we are talking about waste materials, nuclear waste materials are only a minute volume proportionately, we know this. But this minute portion poses a problem that the balance of the wastes do not pose. So we are not mollified, Mr. Chairman, by statistics showing this relatively small percentage of radioactivity wastes in our society. We are not mollified by statements that we know how to manage them. We are not quite sure we do know how to manage them.

ERDA makes statements now and the former AEC made statements that we have means and knowledge and capability for management, but we—and we know there have not been serious leakage problems in the past 30 years, but we know that there have been, nevertheless, problems.

We hear of such things in the press as the leakage discovered by accident at Hanford, Wash. Those kinds of releases, the fact that we find out from the diligent press and not from the agency that is supposed to be protecting the people and guarding the peoples' welfare and long-range interests, are the things that cause us concern.

I am not satisfied and I don't think the legislators are satisfied and I don't think the people are satisfied with the credibility that has been established by the agencies entrusted with this awesome responsibility in the field of nuclear power.

For example, we know that and most high school children are taught that nuclear energy accumulated by the body is accumulated over a life-long time. If you recall a few years ago, radioactivity that was present in shoe X-ray devices in which you could experience what it used to be common for a person to go in for shoes and have the foot fluoroscoped so they could fit the shoe properly. It was then determined that this would be unsafe and not really acceptable to public health concerns and the fluoroscopy devices were eliminated and are no longer used.

Because of the cumulative effect in our society, we have many, many instances where cumulative effect can take hold of a person. Through our life we go in for test X-rays, X-rays of broken bones, X-rays of portions of our body where we experience other illnesses. These effects we are told are cumulative. So even people without a shred of scientific or technical background now know that the radioactive experience of a person accumulates through his life and never leaves him.

Those concerns now cause people to wonder if Michigan were to be the site selected or North Carolina or anywhere else would be the site selected, would these passing vehicles, would the containment capsules have sufficient leakage that people already exposed during the lifetime to certain levels of radiation could be exposed to other levels of radiation as they stand near a truck passing by and things of this nature?

They are concerns that the public has that there are not answers for in the public.

So, if we are talking about making ultimate depository in Michigan for spent fuels, transuranic fuels of any kind, the public has to know, the legislatures of this Nation and particularly the Michigan Legislature since the site under discussion is in Michigan, has to know ahead of time exactly what is to be expected. Exactly what the policies are. What are the procedures that are going to be planned? What safeguards do we have? We have to know that those safeguards are in fact really safeguards.

So we are concerned about these unknowns that come up. You will hear about these from other witnesses here today. But we are greatly concerned about these unknowns, Mr. Chairman, and you expressed them yourself. I have heard you several times. The average man knows, for example, that some of the radioactive wastes don't decay for thousands of years. These are the terminologies, Mr. Chairman, that stagger the public mind, and we have to be reassured, we have to know, the legislatures and Michigan Legislature has to know.

Mr. Jondahl has been eloquent in proposing a procedure that would allow the legislature to be the responsible agent for allowing ultimately any depository in Michigan. I think this procedure is an excellent one. I have not seen it and I don't know its detail, but

his testimony was most eloquent and his points were very specifically made.

We have to have some public control at the scene where the depository might be made of the concepts that we are talking about. We have to have a public awareness and thus a meaningful public control.

One other thing that causes us great concern, we have some of the finest fresh water supply in Michigan in the entire world. If Michigan were to be made a depository for the nuclear wastes, the spent fuels or the residuals of spent fuels which have been by transuranic process changed into other types of radioactive materials, we hear from the Energy Resource and Development Administration that they have now worked out some methods of solidification of these wastes so that perhaps—perhaps making them into glass or some other solid form so there will not be migration once deposited in the earth.

We have water at a depth of 1,300 to 1,400 feet in Lake Superior, Lake Huron goes to 1,000 feet. In Lake Michigan depths of 700 to 800 feet. If we deposit materials, say, in salt beds of 800 or 1,000, 1,500 feet, in 1,000 years, in 3,000 years, do we have assurance, can they give us assurance that the migration from the deposits won't permeate the soils and leach into some of the depths of Lake Superior so that in future generations of mankind would be affected by leaking radiation from these deposits.

Those are the kinds of questions the public doesn't have answers to. We don't know if the encapsulation devices that they are preparing and have worked on have sufficient permanence that would—we all know some of the stories of the encapsulation in ordinary concrete, perhaps even special concrete. But how many of us believe truly that concrete will last 5,000 years, say, in the bottom of the seabed? How many of us truly believe that radiation which takes 25,000 years to dissipate will not be upon future mankind in 5,000 years because of the deterioration of the encapsulation device? Have we been assured that the encapsulation device will be adequate?

I don't think we have. Have we been assured that methods of transport—supposing ships were decided upon as a method of transport to an Alpena side for deposit? Supposing as happened many times in our history that some accident befalls a ship carrying some of these materials to the deposit site and rather than being deposited deep in the saltbeds so many hundreds or thousands of feet below, the ship sinks and the radioactive materials about which we don't have enough information should then be on the bottom of the lake?

These are the kinds of questions that we don't have sufficient answers for. Do we have sufficient answers for the methods of injection into the storage sites?

I don't think we have. I don't think the public has been given assurance that they have any answers in the agency.

The public has seen in the Sunday supplements variations of stories on radioactive materials where in the transuranic stages, when the spent nuclear fuel for example is reprocessed into various

forms of radioactive materials to recover usable fuel from the spent fuel and to make it less dangerous for time in the future, we have not been given sufficient information to make the kinds of decisions that need to be made.

This is one of the reasons I applaud your committee holding these hearings. I look with interest toward the statements to be made here today by agencies of Michigan and by the people of Michigan who will express the concerns that I have given you here this morning.

Then I would leave a final thought with you, Mr. Chairman, gentlemen of the committee, and I think this is most urgent. I visited Los Alamos in my capacity as the chairman of the Science and Technology Committee of NCSL, and I talked with scientists about the process now being worked on at several levels—in part here in Michigan—for atomic fusion as an ultimate means of generation of power for America and the world of tomorrow.

It is not generally known, but some of us have heard, and scientists, I think, know and are not saying, and I think ERDA knows and is not saying—and again credibility is a factor—they are speaking to us saying that fusion offers great potential and offers a method that won't have the dangers with which the present fission method of energy generation is fraught.

They are telling us if we can just solve the fusion problem, we are better off.

Well, Mr. Chairman, I heard and many others are hearing that the waste products of the fusion process as they are now visualized will be insidious gases, gases with dangers that haven't even been realized in the minds of the public, and I don't know if this is true, but I hear this in my visits around the Nation and in various laboratories in various universities. If this be true, I would like to suggest to the Congress through your committee, Mr. Chairman, that the steps be taken now that would preclude the automatic use of areas of the Nation, areas of the world, areas of Michigan, that might be approved in some procedural method in the future for deposit of spent fission nuclear fuels to preclude their automatic use for spent fusion nuclear fuels at some point in the future.

I think at the time fusion becomes a reality, we must have foreclosed by legislation in the Congress the automatic use of the depositories for these fusion materials until we know for sure the kind of waste products we are going to be faced with at that time.

So, I would hope that the Congress can address that question before the question of nuclear fusion processes is fully upon us.

Finally, I would just say that I am not going to leave these materials with you because I think the Congressmen have all been provided copies of most of these materials I have shown you. But the National Conference of State Legislatures has issued a booklet called "Meeting the Challenge," showing what 11 or 12 States are doing in the way of making the legislatures of this Nation aware. They are able to cope with these technical questions as they arise. They are providing legislatures around the Nation with a new mechanism and we are trying several new models of this new mechanism for the legislatures to make technical decisions.

There is no longer a time when you can make a decision whether the row must be plowed straight or not. We are in a technical society and evolving technological time, so legislatures of this Nation and the Michigan Legislature in particular have long since become concerned about the technology of our time and want to be able to make proper knowledgeable decisions with respect to this technology.

I will make final reference to the fact that the National Conference of State Legislatures recently had a conference on the subject of radioactive wastes, deposit, transport and concern.

I can make that available. I think it has been available to the Congress, but I will be pleased to make it available to the members of the subcommittee if you would like further copies. It is a report on radioactive waste management by the National Conference of State Legislatures. It applies to the Nation generally, will Michigan be or not be the site that we ultimately select through whatever process might arise, for this depository. Their concerns as I have expressed here and which the people feel, and which the legislature feels, in which all legislatures feel—we are no longer a group of people that come to town the 15th of January and leave the first day of May and go back to our farm or insurance office. We are a group of citizens who mean sincerely to represent the people who sent us to the capitol in whatever State it might be, particularly here in Michigan. We have genuine concern over the technological questions that such a proposal as we are considering here today offers to the people.

I thank you. I would be pleased to answer any questions you might have.

Mr. CARR. Thank you, Representative Anderson. We welcome your thoughtful input. I know you to be a person who has studied this area a great deal. Because of your professional background, you have a voice that needs to be heard.

I want, without taking up too much time—because I have, I think, already overdone it, Bill—to rehearse with you my concern that if we guarantee a veto to the State of Michigan that somehow or another the State legislature have a role in that, and I don't know whether you were in the room at the time I expressed myself to Dr. Taylor and to Representative Jondahl, your colleague, that it is my hope that the legislature will seek some conversation with those making the decisions in the executive branch in State government. They should make sure that the legislature has a role in the decision-making process. It shouldn't be entirely executive, entirely task force, DNR input, that there are elected representatives besides the Governor although I know he is doing his best.

I also want particularly, in light of your chairmanship of the Science Committee of the National Conference of State Legislatures—to give you the same invitation that I gave to Representative Jondahl. One of the obstacles is this Atomic Energy Act that was passed at a time when nuclear expertise was indeed held by a handful—a tiny handful—of individuals.

It is a law that was passed assuming that the expertise and the information about nuclear technology would not become as wide-

spread as it is today or as we look ahead to the future, as widespread as it needs to be.

I would be grateful if you and your colleagues at the National Conference would like to submit to this committee, to myself, Congressman Ruppe, changes which you think would be in the best interests of State governments and State legislatures in the partnership and decisionmaking process that we can offer in amendments to the Atomic Energy Act under which we have to operate.

Mr. CARR. I want to ask you one question before yielding to my colleague. You are a person who obviously has talked with a great number of nuclear engineers. You have travelled around the country. I know from our own personal conversations you have given this whole area a great deal of thought and reflection. Do you detect among the nuclear engineers, and scientists that you speak to that they have a sort of an arrogant attitude about "we know best"? Do you detect at all any of that?

Mr. ANDERSON. It is an excellent question, Mr. Chairman. Two weeks ago I spoke before the American Nuclear Society and the Canadian Nuclear Association in Toronto on the subject about which your question touches.

That is, the lack of rapport and the need for increased rapport between the nuclear community and the legislatures of this Nation. Not only legislatures, but the people generally, because there has been an arrogance, a feeling which I felt in past contacts over the years. As I say, I have been chairman of this committee for 6 years and I have felt this in many appearances, public appearances, and private appearances, and discussions over the years that the nuclear fraternity felt that the public didn't know enough about it to react properly and that little knowledge was too dangerous to let them have.

I have seen in the past year or two, particularly in a conference just last month in Toronto, the American Nuclear Society, the very fact that they invited me to be a speaker on the subject of this growing rapport and the need for rapport indicates that there is a beginning of softening in the nuclear scientists and nuclear community toward government in general, toward people in general. And so it is true that your question touches upon an area that formerly has been a problem and it still is a problem, but I talked with a great many people in Toronto in the direct business of generation of nuclear power and its proliferation and many aspects of it. There is a noticeable decline in this arrogance and this former feeling that you mustn't let the public know too much.

The decline, I think, is a happy one.

Mr. CARR. Thank you, and I yield to my colleague.

Mr. RUPPE. It is always a pleasure to see you, Mr. Anderson, and renew an acquaintance made over the years when you expressed the State's interests and concerns in Washington. I believe we have gotten together on a number of occasions.

I would like to ask one or two questions. What impact if any would MEPA have on State actions contemplated by the DNR in this instance? In more specific terms, would MEPA require an

impact statement in your opinion completed by the DNR before any type of test drilling program was undertaken?

Mr. ANDERSON. Mr. Congressman, MEPA does not require environmental impact statements. This is not the Michigan Environmental Protection Act. Its function is to allow access through the courts for the general public or individuals in the general public or groups in the general public when they perceive an environmental problem. When they perceive an environmental problem is likely to be upon us. One of the basic functions with which Mr. Carr was most instrumental when he was assistant attorney general, is the—and your first question fits in here, Mr. Ruppe. One of the basic provisions in the Michigan Environmental Protection Act is if there is a likelihood that something could be deleterious, or dangerous, or awesome peril to the environment, and it is an environmental act, it is not a public health act. But to the environment now the people can take action. The legislature can take action. An individual can take action. The attorney general can take action. Any agency of government can take action against any other agency, group, or citizen.

So, it is true that if the depository in northern Michigan were to be considered seriously after exploration and so forth, or even the exploration, itself, if it were to be viewed as a threat to the safety and well-being of the environment, it is true that it could be used in that context as a method by which people could go into court.

Under the old common law which was ruling for many years, it was necessary for some proof of danger to be present, some proof of deterioration or some demonstration of injury to be present. This is not true under the MEPA and so it is possible that someone could use it in bringing this issue before the courts.

Mr. RUPPE. In effect, then, MEPA does not lay any mandates or directions on any State agency, such as the DNR, but, rather, gives its focus to granting to individual citizens the right to enter the courts to pursue their own remedies as they see fit?

Mr. ANDERSON. Precisely.

Mr. CARR. Would you yield on that point just 1 minute? It was my understanding at one time—and I would like to be refreshed in my recollection, particularly if it is wrong—that the Governor by an executive order imposed an obligation on the State agencies similar to the National Environmental Policy Act which required the environmental impact statements?

Now, is that executive order of the Governor still in force?

Mr. ANDERSON. To my knowledge. Mr. Carr, it still is.

Mr. CARR. So we still have the EIS requirement?

Mr. ANDERSON. That is by executive order. We don't have a statutory requirement. Mr. Goldmyer and I have a bill in committee which would require a statutory requirement, which provides for a statutory requirement for EIS under many kinds of conditions, but the present requirement is by executive order only.

Mr. CARR. I thank my colleague for yielding.

Mr. RUPPE. One final question. Would you tell me whether, in your opinion, the State initiatives and referenda, such as the one

put to the ballot in California, proposition 15, have helped expand, in your opinion, the dialog between the nuclear community and the public?

Mr. ANDERSON. That is a good question, Mr. Congressman. The answer is emphatically yes. Here in Michigan and many other States there are efforts on the part of the public to bring requests to the ballot. The one in California shook the nuclear community to its toenails and they worried constantly. They lost sleep over this. Many of them bit their fingernails waiting for the outcome in California.

The nuclear industry, as we all have heard, spent large sums of money to defeat the proposal. The proposal was, of course, defeated as we all know, but the fact was that the progress made by the proposal to the ballot and debate that took place in California has caused the nuclear community to reexamine. I think that is one of the major reasons for the growing rapport I discussed earlier, caused the nuclear community to reexamine some of its processes, some of its policies.

So, I say emphatically yes, to your questions. Yes, this has been helpful and the actions ongoing in other States will continue to be helpful whether or not we finally adopt a moratorium statewide. The debate generated will be helpful in the long run for the benefit of the public.

Mr. RUPPE. Thank you very much.

Mr. CARR. Thank you Representative Anderson. It is a pleasure seeing you again and I hope to work with you in the future on this most important problem.

Mr. ANDERSON. Thank you, and I welcome your subcommittee to Michigan.

Mr. CARR. Our next scheduled witness is Mr. Richard Conlin, representing the Public Interest Research Group in Michigan.

#### STATEMENT OF RICHARD CONLIN, PUBLIC INTEREST RESEARCH GROUP OF MICHIGAN

Mr. CARR. For the record, Mr. Conlin, I, of course, know you and I know the work of Public Interest Research Group in Michigan. I would hope, though, that you might preface some of your remarks for our record to establish a full record on what the group known as PIRGIM does and is all about, and perhaps some of your own background.

Also, before you start, Mr. Conlin, I want to just announce that we are about one-half hour behind our schedule in our witnesses and I do want to afford everyone an opportunity. There were a couple of individuals who were not scheduled who are here and would like to make some expression. If it is all right with you, Mr. Conlin, I would just like to have your statement inserted in the record in full and ask if you might edit your remarks to speed along because I know we would like to have some dialog if you would do that.

Without objection, the statement of Mr. Conlin will be put in the record.

[Prepared statement of Mr. Conlin with attachment follows:]



Public Interest Research Group in Michigan  
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TESTIMONY ON NUCLEAR WASTE STORAGE IN MICHIGAN  
July 6, 1976

My name is Richard Conlin. I am a Projects Director for the Public Interest Research Group in Michigan, and have been directing our Energy Policy Project for the last year. During that time we have extensively researched nuclear as well as other energy issues, and my testimony is based on that research activity.

The question of the long-term storage and disposal of radioactive wastes should have been addressed 20 years ago, when the problem might have been manageable. Because it was not addressed then, we are faced with a potentially disastrous menace to public health today, and will face an impossible situation in the future if we continue our production of radioactive wastes without knowing what to do with them. The agencies entrusted with the responsibility of regulating the nuclear waste situation have in the past been consistently negligent of their duty. They must be prevented from again making the sloppy and irresponsible decisions that have previously characterized their work. Michigan may be the victim of this irresponsibility if action is not taken to protect our citizens.

All operations that produce or use nuclear materials generate radioactive wastes. The wastes produced vary widely in volume, composition, and the intensity and longevity of radioactivity. There are currently more than 1300 distinct types of radioactive elements, giving off different types of radiation at various energy levels. Most radioisotopes lose their radioactivity rapidly, but some require hundreds or even thousands of years. Plutonium-239, a principle high-level waste product, has a half-life of 24,000 years; that means it takes at least 240,000 years, or ten half lives, for a given quantity of plutonium to decay to the point of relative safety. Until that point, an ounce of plutonium is enough to cause several thousand cancers.

At this time there are approximately 55 million cubic feet of radioactive

wastes stored at 11 sites around the country. A recent EPA study estimated that approximately 1 billion cubic feet of low-level waste will be stored by the year 2000--enough to cover a 4-lane coast-to-coast highway one foot deep; plus 80,000 10-foot steel canisters of high-level wastes estimated to be produced by ERDA.

All of these wastes present severe health hazards. We know that a radiation dose of 600 Rads will cause death in a human; we also know that low-level doses of radiation cause cancer and genetic mutations, but no safe threshold for radiation has ever been scientifically established. We've had 4 billion years to evolve in response to the level of background radiation provided by the sun; we simply don't know what the long-range consequences of even small amounts of additional radiation, and of the different types of radiation we are creating, on human life. Radioactive particles may be stored in body tissues (strontium-90 in the bones; iodine-131 in the thyroid; plutonium particles lodged in the lungs), and may accumulate through food chains.

These are some of the reasons why the proper containment and storage of radioactive wastes is a crucial issue for us. Yet the record of the past has been inattention and neglect. As the Comptroller General of the United States noted in his report, "Improvements Needed in the Land Disposal of Radioactive Wastes--a Problem of Centuries," published January 12, 1976:

. . .it is not known what mix of hydrogeological characteristics and engineering features offer the greatest assurance that radioactivity, once buried, will not migrate to create a possible public health hazard and require extraordinary and costly efforts to correct.  
 . . .GAO found that  
 --site selection criteria have not been established,  
 --important earth science characteristics are not well defined, and  
 --some disposal sites now are releasing radioactivity to the environment.

The report further noted that "ERDA disposal sites were selected mainly .

because the land was already federally-owned, the disposal sites were convenient to the waste-producing activity, and the disposal sites provided a use for lands of otherwise marginal utility. . . . For some of the disposal sites established in the 1940's, there were no geological evaluations." The report goes on to document the other violations of scientific principles and of plain common sense in the headlong rush to brush aside all obstacles to a nuclear economy.

And the consequences have been grave. At Maxey Flats, Kentucky, radioactivity has been leaking into the environment since 1972. This February, the Environmental Protection Agency discovered that plutonium was among the substances leaking: "Plutonium was detected in surface soil, in soil cores 90 cm deep, in monitoring wells, and in streams which drain the site."

At West Valley, NY, radioactivity has been detected in streams draining the site, and further disposal activity has been suspended.

At the Holifield facility, near Oak Ridge, Tennessee, radioactive materials have leaked into a creek and from there to the Clinch River. In the creek, the level of radioactivity exceeds even the generous federal maximum limits.

A US Geological Survey study at the Idaho facility has detected radioactivity more than 100 feet below the disposal site. New leakages have recently been revealed by NRC at the Beatty, Nevada, site.

Finally, and most acutely, there have been a continuing series of leaks at the Hanford, Washington, waste storage site: cumulatively, in excess of 500,000 gallons of liquid waste, containing well over half-a-million curies of radiation, have leaked from the Hanford tanks.

Six of the eleven sites used for radioactive waste storage have had leaks: This is part of the record that we should judge when we examine the proposal to store wastes in Michigan. Unfortunately, there's more.

Recognizing that its present storage sites could not be considered smashing successes, for many years the AEC and its successor, ERDA, have searched for a permanent waste storage site, in a stable geological formation where wastes could remain undisturbed for centuries. Salt formations have been the primary candidates. Twice they thought they had it.

In 1970, a National Academy of Sciences committee on nuclear waste was in Kansas working on a report concerning the use of salt formations for the disposal of radioactive wastes. During this time, the AEC, without notifying the committee, announced a "tentative selection" of a salt mine near Lyons, Kansas, as the initial site for the burial of radioactive wastes. Upon hearing this, the committee decided they should include in their report something about this specific site. After a quick revision, the final report came out, favorable towards the use of salt mines for burying wastes in general (as the committee had said in the past), and tentatively approving the specific site, subject to the outcome of future tests. Those proponents of the Lyons site, notably the AEC, considered this an endorsement of the site, and spoke of it as such.

In March, 1971, Milton Shaw, the Director of the AEC's Divisions of Reactor Development, told a joint committee that "another year's work of research and development in this area on top of 15 years of work will not be particularly productive. We need the project and are ready to proceed with it. Moreover, we are convinced that the Lyons site is equal or superior to the others. The valuable data gathered there during (our study is) unique to the Lyons mine."

Yet, in September, 1971, only months after this decisive announcement, the site had been found unacceptable. The AEC asked the Kansas Geological Survey and the Oak Ridge drilling consultant to look for other possible sites. The results: "of eight areas considered, three were judged to have potential worth an investigation, four were deemed less promising, and the area which included Lyons was deemed the 'poorest candidate' of all."

There were numerous reasons. Holes were found, from past oil and gas exploration wells, some of which could not be plugged and thus left dangers of water being able to leak in. It was also found that there had been solution mining for salt nearby (1800 feet away underground), a process which removes supporting pillars, thus creating the possibility that nearby areas could collapse and form a deep surface lake. Finally, the American Salt Company had once tried hydraulic fracture technique in mining nearby. This process involves forcing water down one hole which dissolves the salt and brings it up a second hole. During this process, however, it seems that 175,000 gallons of water were misplaced somewhere underground. Neither the company nor the AEC knew where it was. The possibility existed that it might be moving toward the proposed site. Upon learning of these numerous faults, consideration of the site was withdrawn. Yet this was the site which was once tabbed as the definitive answer and a perfect location for radioactive wastes.

Salt formations in the Carlsbad, New Mexico, area next came under study as a possible site. Past oil and gas explorations found here also impeded initial progress and attention was shifted to another site in the area. An article in the Denver Post on October 13, 1975, revealed a confirmation from project officials that the second site was found to be "underlain by brine contaminated with toxic gases." Despite these twin setbacks, at the ERDA budget hearings it was stated that "in fiscal year 1976, site selection investigations to more accurately define the geology and hydrology of the study area of southeastern New Mexico will be continued and a candidate site selected."

Now, these are the kinds of careful analysis and prudent decision-making which have been characteristic of federal nuclear activities. And we have seen no evidence that splitting the AEC into ERDA and NRC have changed the perspective

of the regulators; in fact, the same people are still staffing nuclear regulation; only the decision-making process has been muddled, to further confuse the public.

As far as we can determine, the selection of a nuclear waste disposal site will be made by both agencies, in that ERDA will conduct the investigations, develop the site, and then apply to the NRC for a license to operate. If these were truly independent agencies, we might have some confidence in this split responsibility. But all one has to do is look at their press releases to realize that both agencies serve essentially as promoters of the nuclear industry. ERDA unabashedly pushes nuclear power, devoting over 50% of its budget to it, while the NRC has never denied a license application for a nuclear plant. The likely consequences of the present system, then, is as follows:

--Each agency will disclaim responsibility for the final decision; ERDA will state that its work is preliminary, while NRC will then turn around and claim that it is merely following ERDA's recommendation.

--Public anticipation will be correspondingly frustrated: people will troupe from hearing to hearing, only to be told that they are in the wrong place; organizations and agencies will have to expend extra effort to monitor two procedures.

--Because of the unclear division of responsibility, there will be a tendency to avoid issues and continue the past pattern of sloppy work.

Action needs to be taken to resolve all of these problems. We don't know what the solution is to our present radioactive waste problem, but we do know that something must be done now. Two types of actions are necessary.

First, the procedure for waste disposal decision-making must be clarified, to eliminate the conditions that produced the disasters of the past, and prevent the future structure from being unresponsive to the public. We suggest the following:

(a) Enact a statutory process for decision-making, with a clear and truly objective decision-maker (possibly the federal judiciary), adequate provisions for public knowledge and input to the decisions, avoidance of the advocacy role of the federal agencies presently involved, and full participation by representatives of affected agencies such as the Environmental Protection Agency, the US Geological Survey, and public health authorities;

(b) Include provision for funding of technical and legal assistance to citizen intervenors in this process, to ensure that ordinary citizens will be represented;

(c) Mandate state and local veto power over unacceptable plans, with a clear mechanism for exercising such vetos, not just a vague suggestion that "the state would have input" or "the people will have the final say." We've had enough of glittering generalities and bureaucratic obfuscation. We want real influence over what happens in our own back yards and we want it spelled out now.

Second, besides these procedural reforms, we need to examine the production of radioactive waste and ask ourselves whether we're going to be able to handle increasingly large quantities and, if not, whether we ought to continue producing this waste. After all, the best way to control pollution is source reduction. We suggest the following:

(a) Require that a safe and assured method of waste disposal be developed before we proceed with a massive investment in nuclear power facilities. It would be a sad tragedy for us to commit so many resources to such a shaky technology, only to condemn ourselves and future generations to cancer and genetic damage for many centuries. Let's take a conservative viewpoint on this issue, and be sure we're right before we go ahead.

(b) Finally, save the taxpayers several billion dollars annually and

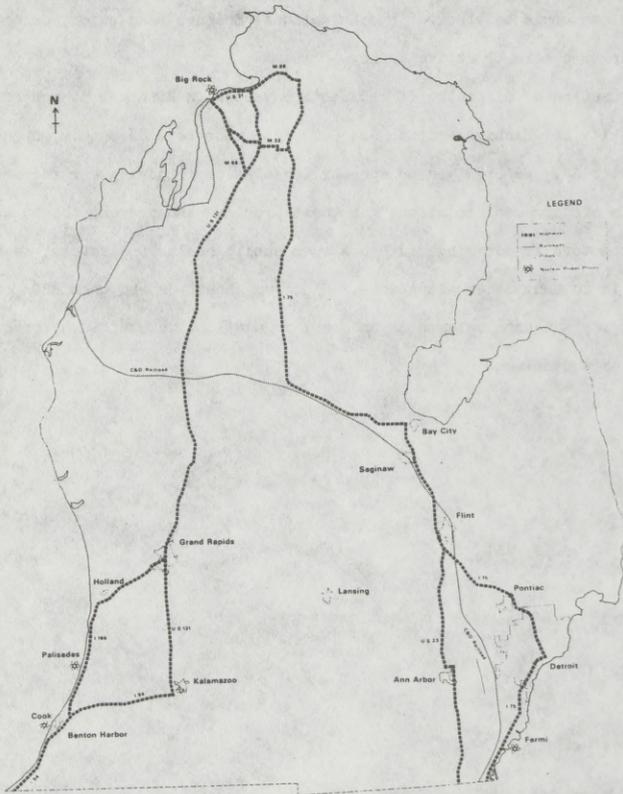
clarify our whole energy picture by abolishing both the Nuclear Regulatory Commission and the Energy Research and Development Agency. We don't need to spend this money promoting nuclear power; it could do a lot more good spent on alternatives. The NRC functions should be put where they belong, with the Environmental Protection Agency, and ERDA's research functions could be absorbed by the National Science Foundation, or some similar and more objective agency.

The question of disposing of radioactive wastes in Michigan is one of the utmost gravity for Michigan citizens. Decisions must be made openly, objectively, and without bias. We urge you to sponsor legislation embodying our recommendations in order to provide real solutions for these problems and prevent the bureaucratic nuclear promoters from riding roughshod over public health and safety, as they have done in so many other situations. Since we cannot depend upon ERDA or the NRC to provide adequate safeguards and real regulation, we must turn to you, our elected representatives.

Thank you.

# FALLOUT ON THE FREEWAY

The Hazards of Transporting  
Radioactive Wastes in Michigan



**A PIRGIM REPORT**  
by **Marion Anderson**  
**January 18, 1974**

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PIRGIM--the Public Interest Research Group in Michigan--is an independent, nonprofit Michigan organization created, funded, and controlled by over 40,000 students at five universities.

Through PIRGIM, students work with their own professional staff to bring about needed social change.

PIRGIM works through public education, administrative procedures, legislative lobbying, and litigation.

It takes action on skyrocketing utility rates, degradation of the environment, indifferent government bureaucracies, high unemployment, inflated medical care costs, excessive food prices, consumer deception, and other violations of the public interest.

## INTRODUCTION

## The Casks Didn't Open . . . This Time

At 10:00 a.m. on Thursday, December 20, 1973, there was a severe accident on the fog-shrouded, ice-covered surface of Interstate Highway 80 near Stroudsburg, Pennsylvania. This accident was quite different from the numerous others that took place that day on the Interstate, because one of the six semi-trailer trucks involved was carrying two casks filled with radioactive cobalt being transported from Cleveland to Brooklyn for shipment abroad.

Trooper Sileski of the Pennsylvania State Police described the accident this way:

Two semi's and two cars had stopped on the roadway because of a blockage. A Mobil Chemical Company truck carrying flammable lacquer and two more semi's came upon the scene and tried to stop. The Cooper-Jarrett truck, which contained the cobalt, struck the two moving semi's in the rear, thus beginning the chain reaction. One of the semi's struck the parked car and it burst into flame. Five out of the six trucks involved, including the cobalt truck, were severely damaged, and both cars were totaled.

Mr. Martin Kohn was the driver of the car which burned. His car was off the right shoulder of the road. The Cooper-Jarrett truck carrying the cobalt was in the passing lane, adjacent to Kohn's burning car. He said that when the state troopers arrived they first tried to find out if anyone was killed or injured. He said:

I went to sit in a state trooper car with one of the drivers. At about 11:00, a fireman came up to the state trooper and said, "The Cooper-Jarrett truck has 'Radioactive' on it." The driver I was sitting with said, "That's my truck, but I don't know what's in it. I'll have to get my manifest." When he found the paper, it said "Cobalt."

The State Police then called in for help to find out if they and the surrounding people were getting irradiated. Theoretically, the radiation experts would have been brought in by helicopter. But that was not possible as the fog which helped cause the accident also made it impossible to use the helicopter. By about 12:00, two hours after the collisions had occurred, the radiation experts arrived over the ice, through the blocked traffic, by car.

This time, the steel and lead casks containing the radioactive cobalt had not ruptured. But it had been the truck which was carrying them which had begun the chain of collisions. Thus, most of the \$40,000 damage sustained by the cobalt truck was in the front end, not in the rear with the cargo. The truck carrying the highly flammable lacquer did not catch fire, and the car which did burn was not close enough to the cobalt truck to ignite it. So the two casks did not open.

In a telephone interview, the shipper of the radioactive cobalt, Mr. Joseph Stickney, Manager of Therapy and Nuclear Operations of the Picker Corporation of Cleveland, said that what worries him the most is a combination of fire and impact. He said, "If the truck had caught fire, it could have been very serious." If a cask had opened, he said, the people who were three feet from it could take only a minute of exposure, and the people at twenty feet would have gotten radiation sickness with

one-half hour of exposure.

Had the impact been more direct, had the collision caused a fire in the lacquer truck, had the burning car been twenty-five feet closer to the cobalt truck--the drivers, firemen, state troopers, and bystanders might now be stricken with radiation sickness.

\* \* \* \* \*

This near-catastrophe in Pennsylvania occurred seven months after PIRGIM had begun an inquiry into the safety of present methods for transporting highly radioactive waste products from nuclear power plants to distant storage and reprocessing sites. The genesis of the study was a conversation with the sheriff of Ingham County, in central Michigan, who said he had long been worried about the shipments of radioactive materials through his county--what would happen when they were in an accident?

The research in this report involved the cooperation of over twenty people, many of them highly expert in their fields (see Appendix D).

PIRGIM tried to find answers to three questions:

1. Has the U.S. Atomic Energy Commission been forthright in stating the possibility of accidents which could release radioactive poisons into the atmosphere?
2. Has the AEC reported candidly and accurately to the public the potential effects upon the lives and health of people when accidents occur?
3. Can the situation be improved?

This PIRGIM report has been prepared to help the citizens of Michigan, and of the other states decide whether the

transportation of radioactive materials over their highways and  
railroads, through their communities, and past their hospitals  
and schools, poses an acceptable or an unacceptable risk to their  
health and safety.

## Chapter 1

Poison on Wheels:  
Shipping Radioactive Waste in Michigan

There are three products from nuclear power plants: electrical currents, heat, and radioactive poisons. This report concerns only one aspect of what happens to the radioactive by-products from these plants: the shipping of casks containing radioactive wastes on the highways and the railroads of the State of Michigan.

Most people have no idea what a nuclear power plant does. A nuclear power plant is an extremely complicated, dangerous device for heating water. The fissioning of the atoms (the same procedure as that taking place in the detonation of an atomic bomb) gives off heat which produces steam which turns a big turbine. The turbine produces the electricity.

Disposing of Radioactive Wastes

The by-products from this procedure are essentially the same as those from the explosion of an atomic bomb. These by-products, or waste materials, are poisonous to most living creatures. They are especially toxic to that most delicately formed and complicated of beings: man.

These wastes include irradiated fuel rods - long metal clad rods containing uranium which have become highly radioactive during two or three years inside the reactor. They also include resins and other substances now radioactive. These wastes must be put into lead and steel casks. The fuel rods are physically surrounded with cooling water. They are shipped to a plant for reprocessing, or to a site for burial. They must travel by train or truck over the highways and through the cities of our state.

The irradiated fuel which is shipped is both physically hot and intensely radioactive. The entire environment must be protected from it: air, soil, water, and living beings. Some of the radioactivity lasts almost forever, 25,000 years.

In the maps on Appendix A, you will be able to see how close this radioactive poison comes to you. You can see how near it is to where you live and work, how close to the schools and the hospitals of your town or city.

But before we go into the problems associated with the building and use of the casks carrying radioactive wastes, and of the road conditions and accidents of Michigan, let us see what the United States government's Atomic Energy Commission has to say about the transportation of radioactive materials.

#### The Case of the Atomic Energy Commission

The AEC has a very simple case. It goes like this: It is true that there are no special inspections of, or requirements for, the trucks and trains which ship radioactive waste. It is also true that the drivers have no special training or equipment for this task. Nor do they have to contact the state police to inquire about road conditions. But it makes no difference. For the casks whose designs the AEC approves will not leak. They will not rupture. And even if, by the most remote possibility, they do open, it is most unlikely that the escaping radioactive materials will have serious effects upon the surrounding population. That, in a nutshell, is the AEC position.

\* \* \* \* \*

We shall try to show in the following pages that there are

serious flaws in the above arguments, and that the people of Michigan, and of the United States, who live near the routes taken by the trucks and trains which carry these casks, do indeed have something to be concerned about as they value their health and that of their children.

## Chapter II

## What the AEC Doesn't Want You to Know

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The AEC has avoided bringing to public attention the presence in shipment casks of great quantities of radioactive cesium, which could escape into the environment and do great damage to life.

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The Atomic Energy Commission has not been forthright with the public about the possible emissions of the casks which carry irradiated fuel (fuel which has been in the reactor for a while). A recently written AEC report<sup>1</sup> has a number of tables showing the radioactive materials that would be released in the event of an accident. They analyze three types of releases: iodine 131, krypton 85, and gross fission products. All of these substances are harmful to human beings exposed to them. The radioactive iodine gives people cancer of the thyroid; krypton adversely affects the skin, and gross fission products affect the gonads, bones, and lungs. But these substances would not be released in such harmful quantities as the element which the AEC does not want to talk about: radioactive cesium.

In a study just completed (see Appendix B),\* Professor Marc Ross, a physicist at the University of Michigan, has found that accidents in the transportation of used nuclear fuel could not only cause great damage to land values but could be very dangerous for everyone living downwind within many miles of the accident. The study pinpoints radioactive cesium as the culprit. This material is much more important than the radioactive materials considered in transportation accident analysis by the AEC and the nuclear industry.

In previous studies by the AEC, the possibility of release of radioactive gases at normal temperature have been considered in detail. The AEC

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\*This study, Appendix B, has been submitted to a professional journal, Nuclear News.

concluded that these gases do not pose a grave threat. Materials which are not gases at normal temperature were assumed to have little potential for escape and wide distribution.

In this report, Dr. Ross has investigated cesium, a major fission product which is not a gas at normal temperatures, but which is volatile. It boils at moderate temperatures. It dissolves readily in water. It migrates through materials relatively easily. Dr. Ross found that an accident is likely to lead to the release of large quantities of cesium as a gas or an aerosol.

After a period of use within a nuclear reactor, the fuel rods, being partly converted into fission products, are replaced. The spent fuel rods are shipped, often great distances, to one of the several reprocessing plants in the country. The radioactive fission products are dangerous materials which must be completely isolated from the environment. Dr.

Ross's study addresses these questions:

1. What is the possibility for radioactive materials to escape in the event of a transportation accident involving a cask containing spent fuel rods?
2. How much radioactive cesium would escape?
3. What would be the consequences upon the land, health, and lives of people in the neighborhood of the accident?

#### How the Cesium Could Escape

A typical cask in which the spent fuel is shipped, although a very heavy, sturdy container, is particularly vulnerable in one respect: it is filled with water which, because of the heat emanating from the spent fuel, is hot and at high pressure. The water temperature is above the boiling point, and pressures are up to 20 times normal atmospheric pressure--up to 300 pounds per square inch. The cask is like a huge pressure cooker. The water or steam will seek to escape.

As the traffic in reactor fuels becomes much heavier in the next decades, according to present AEC and industry plans, accidents involving such escape are

likely to happen. This is the basis for the statement of Dr. Larry Shappert, author of The Cask Designer's Guide: "A loss of the cooling water is to be expected from time to time with many large water cooled casks."<sup>2</sup> One day a gasket will leak, or a pressure release valve will be damaged, and the coolant will leak out. Such an accident could be caused by fire, collision damage to the gaskets or a pressure release valve, or simply faulty workmanship--for example, in closing up the cask after loading.

After some steam or water escapes, less water remains to cool the hot fuel rods. This means that the pressure will build up again and the temperature of the interior will become even hotter. More steam or water will escape. This cycle may continue until the cask is dry and only the rods are left.

The temperature of the rods will then rise to 1250°F--1575°F. This is above the boiling point of cesium (1253°F). The cesium will then vaporize and escape from the cask through the same opening used by the water. (See Appendix B for complete explanation.)

#### Probability of Accidents

Dr. Ross estimates that a bare minimum of 162 serious accidents involving spent fuel casks will occur in the United States during a ten-year period 20 to 25 years from now if reactors are built at the rate the AEC projects. As Michigan would probably have about 5% of the nation's reactors, this would mean a minimum of eight accidents involving irradiated fuel in ten years, or one major accident every 15 months. This figure is extremely conservative, as it does not take into account the accidents which might occur due to faulty workmanship or materials. It is a calculation based solely upon accidents during shipping involving collision or fire (see Appendix B, Table I).

These accident figures are made even more conservative as they involve only irradiated fuel, not the tens of thousands of shipments which will contain radioactive cobalt, radioactive resins which are slippery and difficult to handle, and other wastes from the reactors.

The Effects of Cesium on People

Radioactive cesium became famous when the fallout from nuclear weapons tests was studied. It is one of the most hazardous of all radioactive materials. It is long lived. It remains on the surface of the ground. It enters the body readily by breathing and through food chains, and stays in the body for several months. The radiation it releases is very penetrating.

The release of radioactivity calculated in this study far exceeds AEC safety standards and the doses calculated in their earlier studies. The harm caused by this release of cesium would depend upon who and what happens to be downwind of the accident, and on the weather. Under fairly stable weather conditions with wind at about one mile an hour, the gaseous cesium will emerge from the cask like a plume of invisible smoke. It continues to emerge from the cask and to travel as long as the cask contents are coming out. A person about one-half mile downwind could receive a dose of about 160 rems. Deaths of infants, young children, and susceptible people, will occur at this dose. About two percent of the people under the radioactive plume will die of cancer. (See Appendix B). A substantial area would have to be evacuated. Land would remain contaminated for over 14 years.

If instead, the radioactivity is widely dispersed by the wind, it would affect a very large number of people through breathing, eating, and drinking, and simply from the decay of cesium lying on the ground for many years.

Based on average population densities of large Michigan cities, the following numbers of people would die of cancer within 25 years after a rail cask accident involving irradiated fuel: Detroit -- 3,000 people; Ann Arbor -- 1230 people; Flint -- 1580 people; Saginaw -- 1420 people; Lansing -- 1070 people; Grand Rapids -- 1180 people; Kalamazoo -- 940 people.

If there is an extensive suburban area downwind from the accident, some seven hundred cancer deaths are estimated to result within 25 years because of the accident (see Appendix B-9).

N.B. Dr. Ross remarks that this problem would be even more severe for the AEC's proposed breeder reactor operation than for the present type of light water nuclear reactor.

Chapter III  
The Casks: Will They Protect You?

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AEC approval of cask designs, testing procedures and its quality control over manufacture and use are grossly inadequate, according to General Accounting Office studies and other evidence.

The first line of defense in protecting the public against the accidents just described is the design and the manufacture of the casks themselves.

The chief transportation official of the AEC has said that, "the ability of a package to withstand accidents . . . depends both on its design, and on the quality assurance exercised in its manufacture, use, and maintenance."<sup>1</sup>

Dr. James Lubkin, Professor of Civil Engineering and Mechanics, Michigan State University, said, "In a matter involving the public safety to the extent that the transportation of nuclear waste does, we would expect 100% proof testing of every cask, and extensive monitoring and inspection throughout the useful life of the equipment."<sup>2</sup>

The AEC does not do proof testing of the great varieties of casks traveling on the highways and railroads of Michigan. And the respected General Accounting Office, a federal agency answerable to the U.S. Congress, reported recently that there are serious questions regarding the procedures for approving the basic cask designs.

All designs do not go to a central AEC office for evaluation by teams of experts. The various companies designing the casks simply bring the design to whichever of the AEC field operations office is closest to them.

In its report issued July 31, 1973, the General Accounting Office felt that four areas must be covered in order to evaluate adequately the design of casks: structure, thermal resistance, radiation shielding and nuclear criticality safety.<sup>3</sup> (The nuclear criticality safety means establishing safeguards to prevent the material from being massed in sufficient quantity and configuration to cause a nuclear explosion.)

Out of the four AEC operations offices reviewed for adequacy in the GAO report, three or 75%, did not have the expertise to properly evaluate the cask designs which were submitted.<sup>4</sup> The offices either did not have enough trained people to evaluate the adequacy of the casks designs, or just believed the contractors because they "have a concern for safety."<sup>5</sup>

The Chief of the Transportation Branch of the AEC itself said that the review procedures on cask designs involves a potential conflict of interest because the contractor "both designs the container and assists in reviewing its adequacy."<sup>6</sup>

To determine the ultimate resistance of the casks, it is necessary to increase the severity of tests upon them until they give or break. When asked, in an interview, whether the casks were tested to the point of destruction, the authors of the GAO cask report responded that this had never been done. The AEC admits that it does not know at what point the casks would open.

The Atomic Energy Commission does not insist upon proof testing of the great variety of casks now being manufactured and used. Nor does it insist upon testing for a wide variety

of conditions which occur upon our busy highways. Dr. Marc Ross of the University of Michigan says that, "The AEC does not test for impalement at a substantial velocity, or broadside impact at high velocity against curved objects such as bridge abutments. The AEC allows the companies manufacturing the casks to do calculations instead of testing the actual casks under real road conditions." Dr. Ross goes on to say. "Calculations are not satisfactory substitutes for actual tests. In addition, the quality of the actual casks may not correspond to theoretically considered systems."

Used casks may be a particularly serious problem as they could become defective during use. I asked if there was testing after the casks had been filled full of hot radioactive material and had been carried by truck or rail for thousands of miles. The GAO authors, answered that the casks were given a "visual inspection." In view of the number of welds, nuts, bolts, valves, and gaskets, which if cracked or opened would lead to the escape of poisonous gases, this seems a rather casual way of assuring the public of protection.

In 1970, the AEC did an in-house report which concluded that contractors had not adequately documented the way that containers were fabricated, and thus were unable to prove that the casks had been built according to the designer's specifications.<sup>7</sup> In fact, some of the companies manufacturing casks have never been required to develop any quality assurance programs at all. They only have to "assure" the AEC regulatory people that the casks are being properly fabricated.<sup>8</sup>

However, even if the companies making the casks would like

to do their best, the problem of quality control still remains. Edward Sinclair, Assistant Director of Reactor Technology of the AEC said: "We don't seem to be able to get quality control. We've got to improve the quality of workmanship and the quality of design that real people in real situations are able to produce."<sup>9</sup>

The fact that inspection procedures are so inadequate indicates that poorly manufactured casks full of lethal materials, may be on the roads today even if the designs themselves are reasonably good. There is no way of knowing how many companies, in a hurry to get the casks on the road in order to bring in income, may be following the example of a company which was constructing a nuclear reactor:

A worker in a nuclear plant in Norfolk, Virginia complained to his bosses that the joints in critical pipes were being improperly welded. For his pains he was fired. He repeatedly wrote to his Congressman and to the AEC warning of this danger to the public. When the AEC finally inspected the plant, there were 94 defective welds, plus the violation of a long list of AEC quality control rules. Inspections had been made by plant workers instead of trained inspectors.<sup>10</sup>

There are a number of companies that manufacture reactors, their components, or the casks. After the AEC finds out that they are not complying with their regulations does the AEC refuse to accept their services or materials? Not at all. In the GAO's important report, Problems of the Atomic Energy Commission Associated with the Regulation of Users of Radioactive Materials, there is case after case of companies which have been caught in serious non-compliance for as long as ten years, and which are open, operating, and turning out materials for use in the nuclear industry.

## Chapter IV

## Are the Containers Fail-Safe?

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Casks are arriving contaminated at their destinations. Rail and truck shipment create different, but great, probabilities of disaster.

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In April 1969, Mr. William Brobst, now head of the Transportation Branch of the AEC\*, told the Institute for Nuclear Materials Management:

The AEC recently published a set of procedures to be followed in protecting nuclear materials in transportation. The types of protective procedures which the AEC has proposed are notoriously ineffective.... They...rely almost exclusively on the operating efficiency of people whose experience has been one of inefficiency.... I feel it my duty to alert you to the fact that the protective systems on which a great deal of reliance is going to be placed by the AEC, are not as reliable as you might think.\*

The same doubt about protective systems must be raised about companies which manufacture and use casks.

Are the huge casks about which so much has been written, and for which so much money has been paid, fail-safe? The rail casks can contain up to 14,000,000 curies of irradiated fuel.<sup>2</sup> A large rail cask being put into production by General Electric will contain over three metric tons of irradiated fuel. This cask will contain about six times the amount of radioactivity in a Hiroshima-size bomb. The trucks carry smaller casks containing one-half a metric ton of irradiated fuel, equal in radioactivity to a Hiroshima-size bomb.

The casks which are put on trucks, carry not only fuel, but

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\*At the time of this statement, Mr. Brobst was Deputy Director of the Division of Hazardous Materials of the Department of Transportation.

also a variety of other materials and by-products from the reactor operation. They include slippery and soluble resins which, if the cask were breached, "would be very bad if they fell into a river, stream or reservoir."<sup>3</sup> They would rapidly dissolve and contaminate the water supply.

The irradiated fuel rods, the most dangerous of all the cargo carried, would be likely to rupture in an accident at speeds over 50 miles per hour, according to the AEC.<sup>4</sup> Of the material released from the casks carrying irradiated fuel in the event of a leak, 100% of the gases would immediately become airborne,<sup>5</sup> and thus immensely dangerous to everyone downwind of the accident.

Dr. Larry Shappert, the leading authority in the field of cask design, has stated his conviction that the enormous pressure built up in the large water cooled casks will cause a failure, and that one day the coolant will leak out.<sup>6</sup> When the coolant leaks out of the cask, the irradiated fuel will rapidly rise in temperature, as it produces its own heat, and a much greater percentage of the fuel will become gaseous. The gases will then escape from the cask (see Appendix B).

If the cooling water leaks out of the cask slowly, at night, or during a rainstorm, it is most unlikely to be noticed. It will simply disappear into the road, or the railway beds of the state. Then the poisonous radioactive gases will pour out.

The AEC continually says that none of its containers have been breached. But the General Accounting Office has found the reporting procedures required by the AEC are so vague,<sup>7</sup> that casks may arrive leaking and neither the AEC nor the public

would ever know it.

For example, the GAO discovered that between 1969 and 1972, there were 64 unreported instances in which the containers or the vehicles were contaminated above the specified levels.<sup>8</sup> Over a period of 2-3 years two types of containers continually experienced contamination problems. Many of these occurrences of contamination exceeded the allowable limits. These instances were not reported, and were found out only by the GAO's special research.<sup>9</sup>

It seems quite possible that a good deal more contamination of the truck drivers and of the public has been going on than the AEC knows about, is trying to discover, or is reporting to the public.

#### Railroad Accidents

There have been elaborate technical surveys made as to whether trucks or trains are less dangerous as a means for carrying radioactive waste. Dr. Robert Little, Chairman of the Department of Mechanical Engineering at Michigan State University, stated: "I think that the probability of having an accident with high damage involved, perhaps involving fire, is more probable in rail accidents than on the highways because the objects involved (railroad cars and their cargo) are heavier."<sup>10</sup> Mr. Brobst of the AEC states rail to be six times as dangerous as trucks for catastrophic accidents.<sup>11</sup>

In 1969, there were 8,500 serious accidents on American railroads. The Boston and Maine Railroad hauls 10,000 irradiated fuel rods in one huge shipment from the Yankee Atomic Power Plant in Massachusetts to West Valley, New York, every year. But the railroad is having difficulties. In April 1969, there were three

accidents in one week alone on the line,<sup>12</sup> and railroad accidents are on the increase across the nation.

An official of the Palisades Nuclear Plant in Michigan, Mr. Gabel, thought that shipping by truck is safer, "because in the big railway switch yards, casks can get lost and sit there for days. No one person is ever specifically in charge of the car."<sup>13</sup>

#### Truck Accidents

In 1972, there were 3,103 accidents involving two or more trucks on ten Michigan highways.

Truck-truck accidents have the potential for having long fires.<sup>14</sup> Serious fires at very high temperatures would wreak havoc even upon the lead and steel casks in which irradiated fuel is shipped. The casks are theoretically built to withstand temperatures of up to 1475°F for one-half hour. But Dr. Robert Blanks of the Department of Chemical Engineering of Michigan State University, found that when the following substances catch fire they could reach temperatures as high as 3820°F to 4275° -- over 2000°F higher than the casks have been tested for: acetone, acrylonitrile, benzene, o-zylene, 1, 3 butadiene, n-butane, ethylene oxide, heptane, isooctane, propane, and toluene (see Appendix C). Any of these substances in an accident with a truck carrying nuclear fuel could burn at a high enough temperature to melt a portion of the cask. (see Appendix C).

These substances are shipped in trucks upon the highways of Michigan. There is no way to predict when one of these tanker trucks will collide in a Michigan fog or ice storm with

a truck full of irradiated fuel. The resultant fire or explosion could have cataclysmic results. (See case of gasoline tanker fire wrecking a steel overpass in Flint in Appendix C).

#### Case History

On a warm sunny Monday morning, July 16, 1973, a truck carrying used fuel rods left the Big Rock plant at Charlevoix bound for Pleasanton, California. The truck was followed by PIRGIM volunteer Carol Smith and intern Mark Goldstein. During their four hour and ten minute trip, they learned a good deal about the speed, traffic, and road conditions of the truck which bore radioactive waste.

On narrow two lane roads, the truck averaged over fifty miles per hour. At 2:33 p.m., outside Mancelona, on a narrow two lane road with shoulders below the level of the blacktop, the truck went into the left lane to pass a car on a curve. The driver had poor visibility. At 4:20 p.m. the truck tailgated Carol Smith's car and then passed them on a two-lane road. By 4:45 p.m. the truck was going over 70 m.p.h., and passed a truck carrying highly flammable material which was only a few feet away.

At 6:25 p.m., the drivers stopped for dinner. Carol Smith and Mark Goldstein asked the drivers if they knew what they were carrying. They replied that they did, but did not seem too concerned about the possible dangers as they left the truck running during the hour that they were eating and talking.

It is evident from this case history, in which the truck bearing used fuel rods went through numerous small towns, over railroad tracks and rivers until it reached Grand Rapids and

Holland, that it travelled at its normal speed which was high. These roads are snow covered and icy much of the winter. The trucks still use them.

#### A Choice of Two Evils

After conversations with the Michigan State Police, the Ingham County Sheriff, the Michigan Department of Public Health, and two drivers of a truck carrying nuclear materials, the following conditions of highway transport for casks carrying radioactive waste became clear:

1. Drivers receive no special training for carrying nuclear waste;
2. Drivers do not have radiation detectors with them nor have they been trained in their use;
3. The trucks are not inspected, not even their brakes;
4. The drivers take whatever routes they choose;
5. The drivers do not check with the Michigan State Police to find out about road conditions.
6. There are no checkpoints along the route.

When the reactor supervisor at Michigan State University, Dr. Bruce W. Wilkinson, ordered some used (irradiated) fuel rods, the following occurred: "Our fuel rods came from San Diego. The truck went to Joplin, Missouri. They parked the truck in a terminal in Joplin on Friday night with the casks on it. Then they went home to see their families until Sunday. When the casks arrived, the outside of the casks were contaminated. In some places they were two to three times as high in contamination as they should have been according to AEC minimum

standards."<sup>15</sup> One wonders if any little children in Joplin had been fascinated by the big casks and touched them, thus becoming contaminated with radioactivity.

Both trucks and trains have serious deficiencies as safe transporters of radioactive waste. A higher percentage of trucks are involved in accidents, but each accident involves less poison than a train shipment contains. So the public has a choice between Scylla and Charybdis: fewer but more catastrophic accidents, or a larger number of less severe accidents over a period of years.

Chapter V  
Has the AEC Protected Employees of Nuclear Establishments  
And the Public from the Invisible Danger?

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Because AEC inspection and enforcement of radiation safety rules has often been lax in industrial plants, according to GAO studies, we cannot be confident of adequate AEC protection from the dangers of cask transporting.

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One way to judge how serious an agency is about fulfilling its responsibilities to the public is to see whether enough inspectors have been hired to see if its rules are being followed. The AEC is a great proliferator of rules. Inquiries to the agency elicit stacks of regulations to prove how well they protect the public. But do they?

There are 1,877 institutions which are considered high priority for AEC inspection. These include large fuel facilities, major fuel processors, waste disposal firms, refineries, and large industrial users.\* For this mass of institutions using radioactive materials, the AEC has 22 full-time inspectors and 3 investigators.<sup>1</sup>

A survey of nuclear power plants in the upper Midwest indicated that the facilities which shipped out irradiated fuel rods were inspected, at the maximum, once every three to four months. One employee, when questioned, responded, "Boy, I don't think they've ever been here."

This casual attitude about the importance of rigorous and constant inspections has had serious implications for employee health and safety. According to the GAO, at one large facility, the number of employees receiving too much radiation went from 66 persons in 1968, to 117 in 1970. Their average whole body exposure to radiation more than doubled during that period.<sup>2</sup> Nor was this a unique instance.

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\*Besides these large institutions there are all kinds of hospitals and other institutions where the utmost care should be exercised.

Thirty-four percent of the AEC's inspections revealed non-compliance with safety regulations.<sup>3</sup> There were many specific instances at a variety of businesses which recurred even after the companies had been warned that the escaping radioactive material was harming employees, and contaminating near-by sidewalks, businesses, and apartments.<sup>4</sup>

The General Accounting Office examined ten key cases. In eight of them, people had been exposed to levels of radiation in excess of the specified limits.<sup>5</sup> During a recent five-year period, one licensee's employees had 135 exposures to airborne radioactive materials in excess of the regulatory limits.<sup>6</sup>

Plutonium is a material so lethal, that one-millionth of an ounce can cause lung cancer. In spite of this extraordinary hazard, one business still got an AEC permit to process plutonium after years of building up a record of non-compliance with safety regulations. Plutonium contaminated this licensee's facilities and got into the bodies of at least two employees.<sup>7</sup> The GAO report does not recount the fate of these unfortunate people. At the same facility, an employee cut into one plutonium-beryllium rod and inhaled 10 to 14 times the maximum permissible lung burden.<sup>8</sup>

One large licensee who worked with radioactive fuel, had 60 items of non-compliance in five years, and 98 employee exposures. Did the AEC shut it down? Not at all. It continued its business as usual while "planning improvements."<sup>9</sup>

Does the general public fare any better than the employees? In one accident, plutonium was spread to the public office area, the roof top, and the public sidewalks. Also, it spread to the employees' cars, clothing, shoes, and homes.<sup>10</sup> In another accident, the employees left the huge facility with "considerable quantities of contamination on

their shoes and clothing."<sup>11</sup> One must assume that they then went home, talked with their wives or husbands, and cuddled their children, thus contaminating entire families by evening. In an apartment house adjacent to a large facility, the families were receiving up to 10 times the allowable limit of exposure to radioactivity.<sup>12</sup>

However, the AEC did not seem too perturbed. After one employee had ingested some plutonium, the inspector said that "it appeared that no immediate health and safety problems existed."<sup>13</sup>

If the AEC has a record of such casual attention to the health and welfare of the employees of these industries, and of the unfortunate people who are their neighbors, why should we have any confidence that they will protect the public who live next to the highways or railroads upon which radioactive materials are shipped?

CONCLUSIONS

Shipping radioactive wastes upon highways and railroads is an endeavor filled with difficulties for the industries involved and perilous for the nearby population. The casks are complex mechanisms which may fail either due to improper design, manufacture, or maintenance, or through involvement in accidents causing them to open.

As fallible human beings design the casks, manufacture, load, and ship them, error is possible at every step of the way, error which could lead to the painful death of many people.

In order to help the public agencies and taxpayers of Michigan receive the protection they need, we are making the following recommendations:

RECOMMENDATIONSI. Accident Analysis

1. Every present or prospective owner of a nuclear power plant should file a report containing the following information:
  - a. How many people would be killed and how many sickened in the event of a transportation accident in a major city or on one of the major shipping routes?
  - b. The insurance coverage for the above. Who is the owner and who is liable?
  - c. What would be the short and long term effects upon the air, soil, and wildlife with either of the above accidents?
2. This report (recommendation #1) should be judged by a panel of no less than six experts, at least three of whom should come from organizations nationally known to be critical of AEC policies (like the Union of Concerned Scientists).

3. Their analysis of these reports should be done promptly, with hearings open to the public, and their final reports should be made public.

## II. Shift Responsibilities from the AEC to the State of Michigan

The Michigan Department of Public Health should take on the following responsibilities:

1. The right to determine routes traversed by shippers in consultation with the State Police and with the agreement of the local officials.
2. The obligation of publishing yearly reports detailing the emissions from nuclear power plants and their effects upon the health of Michigan citizens.

## III. Shipping Regulations

1. All casks coming into Michigan to be tested independently by the AEC and an independent laboratory under contract to the Michigan Department of Public Health. One cask of each type is to be tested to destruction.
2. All casks should be equipped to show red warning lights on the outside and to sound a clear loud buzzer inside the cab as soon as the radiation outside the cask rises above a very low level.
3. A two-way radio on the truck for immediate notification of an accident if the driver is still alive.
4. All casks should be painted bright yellow with "DANGER, RADIOACTIVE MATERIALS" painted on them in letters clearly visible for 250 feet.

5. All trucks used for carrying radioactive material should be inspected by the Michigan State Police before every shipment, applying stringent safety standards jointly developed by the Michigan Departments of State and Public Health.
6. The Michigan Department of Public Health should make a survey of all hospitals enroute to see if they have facilities to treat patients who have been exposed to radioactive materials.
7. State and local police must have some people trained in the use of radiation equipment.

IV. The State of Michigan, Recognizing its Great Dependence on Power, Should Put Major Funds into Research and Development of Clean Power

Cleaner, more efficient use of coal to produce electricity is a relatively near term goal. Coal gasification or liquification, and combined gas and steam cycles based on coal could be developed and demonstrated in Michigan. Fuel cells based on coal gas should be actively explored. So should alternative sources such as solar and wind power.

Equally important with improved supply is the efficient use and control of peak demand. To achieve this, many avenues of engineering development and institutional development are available, from the beneficial use of waste heat from decentralized power generation, to utility system peak demand charges.

The state government, with research monies and through the regulatory and taxing powers, could help channel our growth in directions which minimize risk and maximize benefits to our citizens.

## NOTES

Chapter II: What the AEC Doesn't Want You to Know

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2. Interview with Dr. James Lubkin, Michigan State University, School of Engineering, October 10, 1973.
3. General Accounting Office, Opportunities for AEC to Improve Its Procedures for Making Sure that Containers Used for Transporting Radioactive Materials are Safe, 1973, p. 15.
4. GAO Opportunities, p. 16.
5. GAO Opportunities, p. 15.
6. GAO Opportunities, p. 17.
7. Interview with Mr. Hugh Wessinger and Mr. Ralph Carlone of the General Accounting Office, Washington D.C., September 26, 1973.
8. GAO Opportunities, p. 2.
9. "The Scientific Facts Behind the Hassle Over Atomic Energy," in Popular Science, September 1973, p. 81.

## Chapter III continued

10. Environmental Education Group, "Clear and Present Danger," p. 31.

Chapter IV: Are the Containers Fail-Safe?

1. Excerpts from the April 1969 meeting of the Institute for Nuclear Materials Management from "Clear and Present Danger", p. 38.
2. The Atomic Energy Commission, "The Safety of Nuclear Power Reactors and Related Facilities," WASH 1250, 4-58.
3. Interview with Donald Van Farrowe, Radiological Division, Michigan Department of Public Health, July 23, 1973.
4. Atomic Energy Commission, Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, December 1972, p. 80.
5. AEC Environmental Survey, p. 80.
6. Telephone interview between Dr. Marc Ross of University of Michigan Department of Physics and Dr. Larry Shappert, author of The Cask Designer's Guide, Oak Ridge National Laboratory, November 16, 1973.
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8. GAO Opportunities, p. 25.
9. GAO Opportunities, p. 26.
10. Interview with Dr. Robert Little, Chairman of the Mechanics, Metallurgy and Materials Science Department, School of Engineering, Michigan State University, November 19, 1973.
11. Brobst, "Probability", p. 14.
12. "Nuclear Threat Inside America," Clear and Present Danger, p. 14; reprinted from Look.
13. Conversation between John Gilligan, graduate student of nuclear engineering, and Mr. Gabel, of the Palisades Nuclear Power Plant, South Haven, Michigan, November 28, 1973.

## Chapter IV continued

14. AEC Environmental Survey, p. 66.
15. Interview with Dr. Bruce W. Wilkenson, Reactor Director, Michigan State University, November 13, 1973.

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Chapter V: Has the AEC Protected Employees of Nuclear Establishments and the Public from the Invisible Danger?

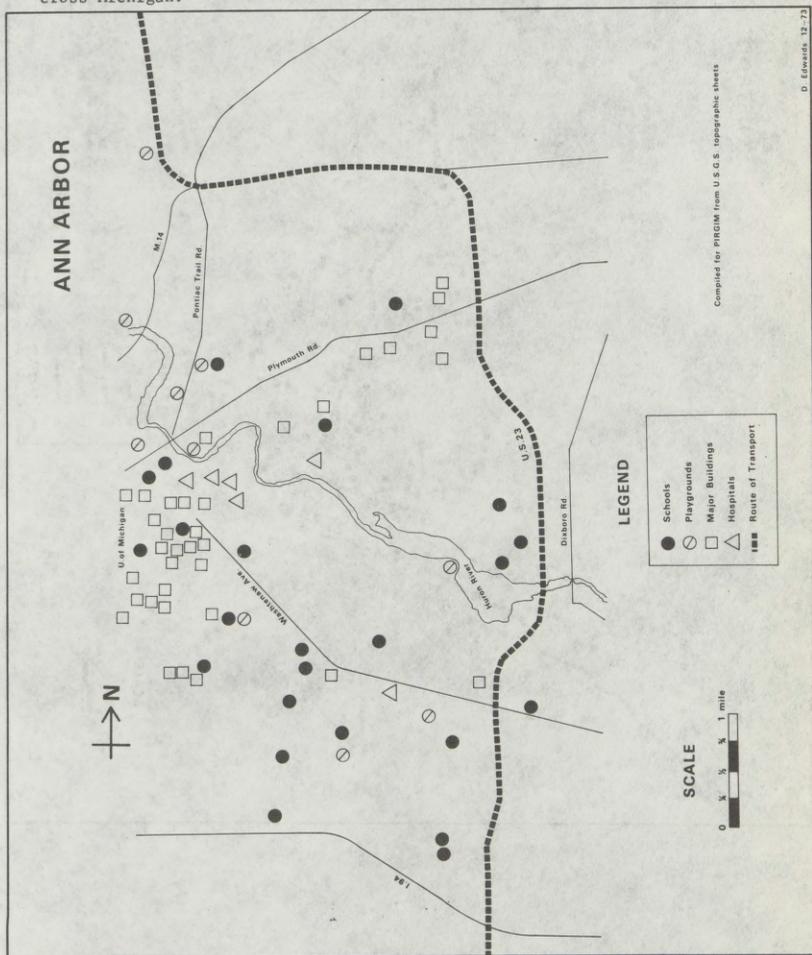
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1. Problems of the Atomic Energy Commission Associated With Regulation of the Users of Radioactive Materials for Industrial, Commercial, Medical, and Related Purposes, the General Accounting Office August 18, 1972.
2. GAO Problems, p. 79.
3. GAO Problems, p. 1.
4. GAO Problems, pp. 18-41.
5. GAO Problems, p. 2.
6. GAO Problems, p. 85.
7. GAO Problems, p. 33.
8. GAO Problems, pp. 36-37.
9. GAO Problems, pp. 78-79.
10. GAO Problems, p. 37.
11. GAO Problems, p. 88.
12. GAO Problems, p. 24.
13. GAO Problems, p. 35.

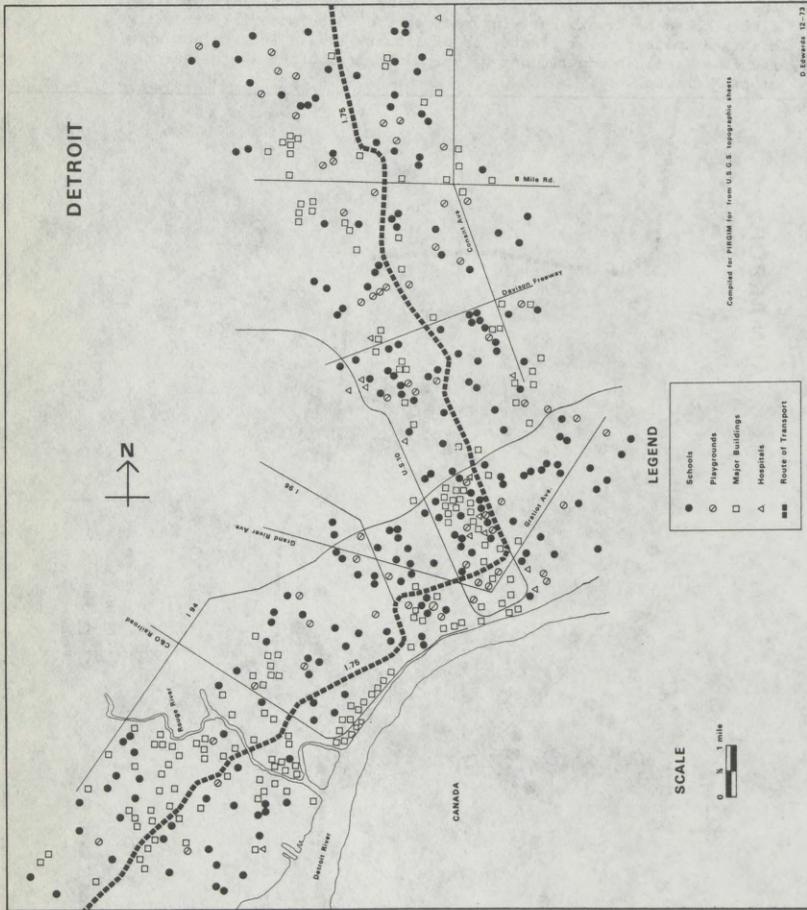
## APPENDIX A

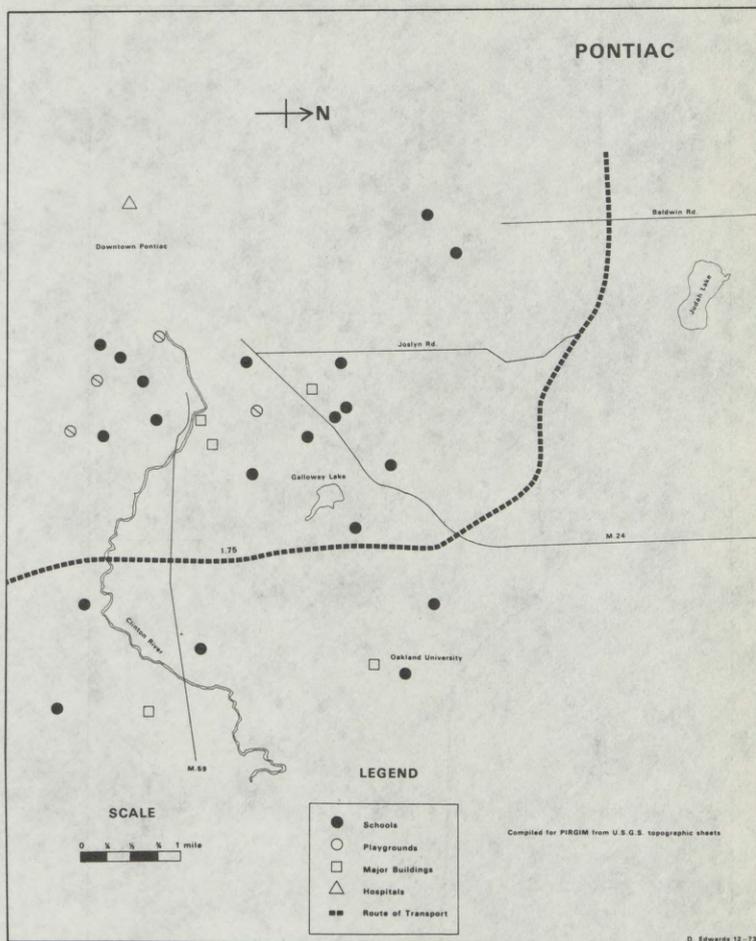
## MAPS

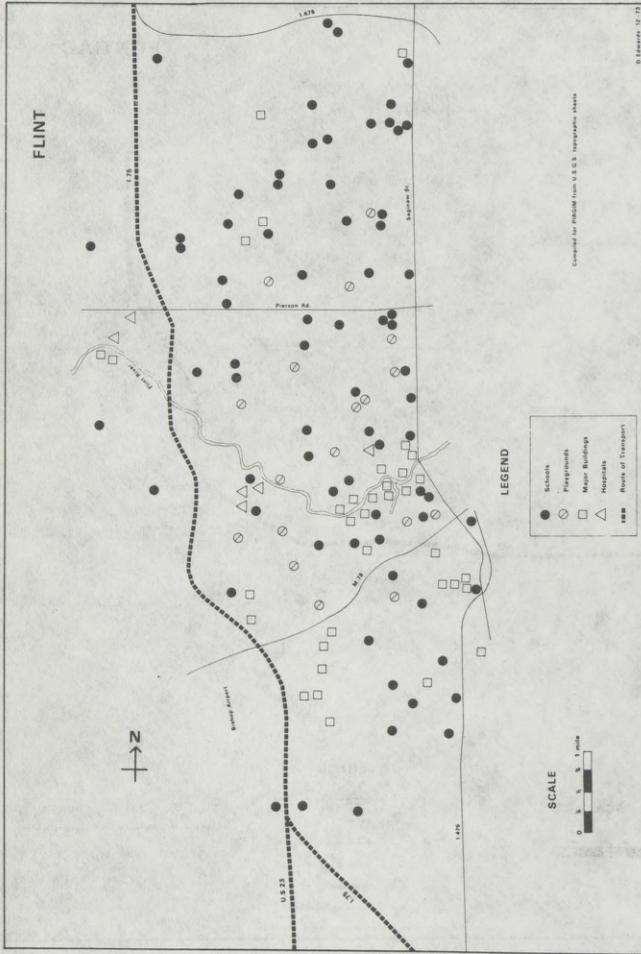
The maps on these pages show routes through lower peninsula Michigan cities taken by trucks carrying radioactive waste materials from Michigan nuclear power plants, as of January 1974. They do not show routes of rail shipments, nor of shipments from other states which cross Michigan.



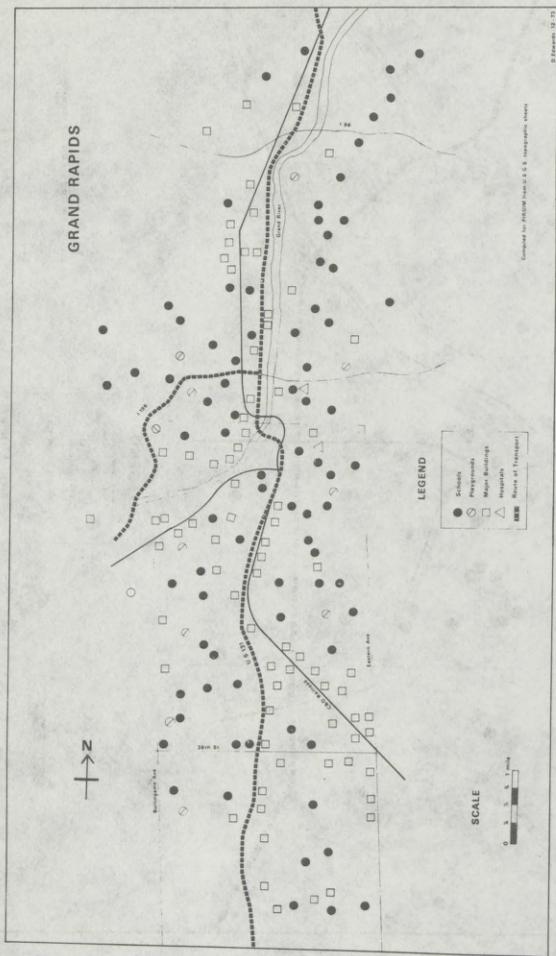
APPENDIX A-2

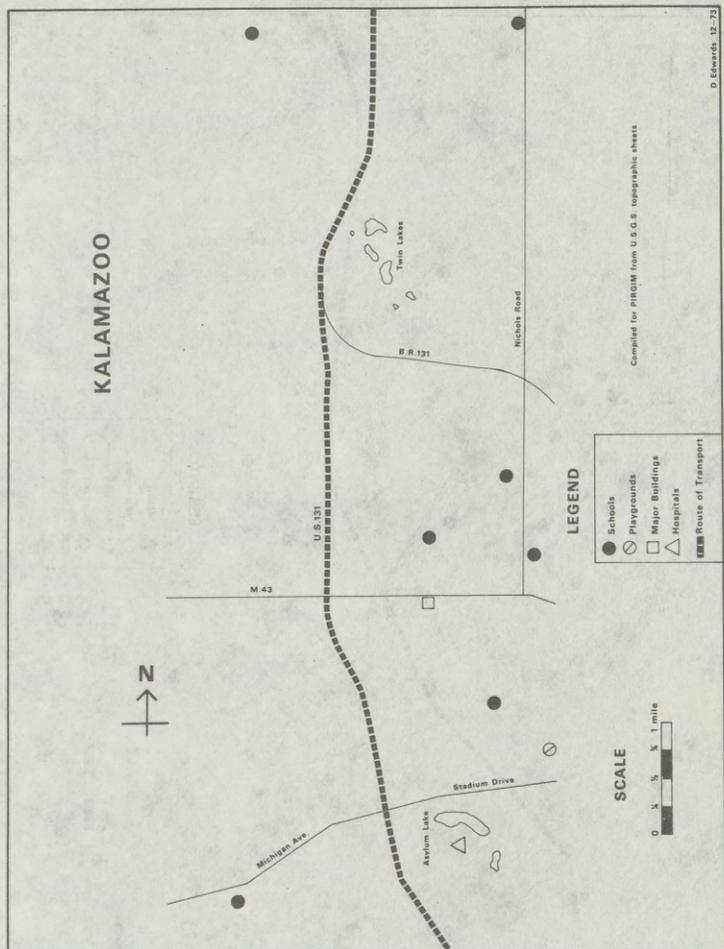


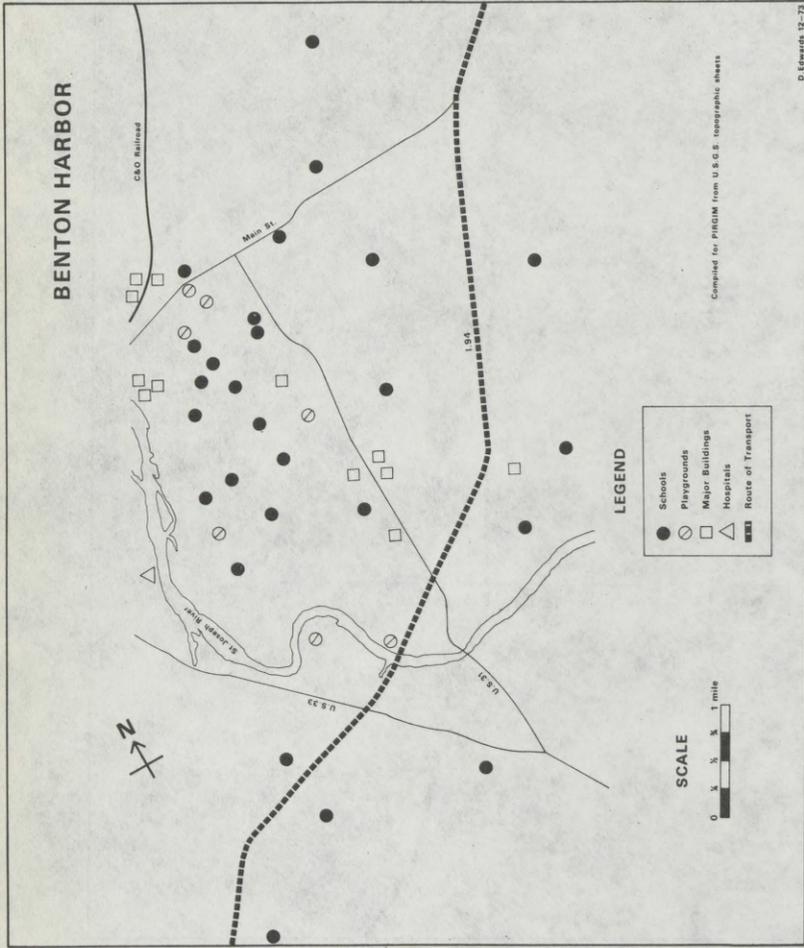












## APPENDIX B

## The Possibility of Release of Cesium in a Spent-Fuel

## Transportation Accident

Marc Ross  
Physics Department  
University of Michigan

In this report we consider the hazard associated with the release of cesium in a hypothetical event in the transportation of spent reactor fuel. We find that release of Cs presents a very grave problem, much more important than the release of krypton and iodine considered in previous studies. An accident in the transportation of light water reactor fuel to the reprocessing plant is assumed which results in loss of the cooling water from a cask. This eventuality has been previously considered,<sup>1,2,3,4</sup> but detailed attention was restricted to the gases krypton ( $Kr^{85}$ ) and iodine ( $I^{131}$ ). The loss of coolant will also lead to escape of some volatile and soluble fission products.

The most important fact which brought us to the present study is that the Cs migrates in the fuel pellet during irradiation and substantial quantities escape and are deposited on the cladding. Furthermore, the cladding of the fuel pins in the postulated accident would experience much higher temperatures than in normal reactor operation.

In this report, we estimate the amount of release of Cs from the fuel, from the fuel pin, and from the cask into the atmosphere, and find it to be substantial. We then consider the exposure to which a population might be subject at a distance from the cask. The isotopes involved,  $Cs^{134}$  and  $Cs^{137}$ , are among the most potent known. The ensuing somatic effects and implied effects on land use are briefly discussed.

## Appendix B-2

Quantity of Cesium Released from the Cask:

One metric ton (MT) of spent LWR fuel (33,000 MWD/MT average burn-up) contains, after cooling off 90 days,  $2.3 \times 10^5$  curies of  $\text{Cs}^{134}$ ,  $1.1 \times 10^5$  Ci of  $\text{Cs}^{137}$ ,  $1.1 \times 10^4$  Ci of  $\text{Kr}^{85}$ , and 381 Ci of  $\text{I}^{131}$  in addition to other radioactive materials.<sup>5</sup> Under typical licenses, the fuel must cool off at least 90 or 120 days depending on the cask. Spent fuel may be sent for reprocessing by road or rail. Typical large casks are water filled and contain .5 MT and 3.2 MT respectively.<sup>6</sup>

An accident in transit could result in various degrees of damage to a water filled cask: 1) There could be zero release or no substantial release of cooling water (or radioactivity) in a period of, say one day. 2) There could be seepage of coolant or flow of coolant through a small orifice or pressure crack such as might result from damage to a pressure release system, to distortion of the cask in the neighborhood of a gasket, or to excess heating of the coolant, resulting in substantial loss of cooling water over an hour to a few hours. This would typically result in drying out the cask as steam is released via some pressure release mechanism. 3) There could be a major breach leading to rapid loss of coolant.

It is difficult to predict what kinds of accidents or impact, with what probability, would characterize the various possibilities mentioned above. The major cask test standard involves impact against a flat surface. Impalement at substantial velocity, as may occur in rail accidents, or broadside impact at substantial velocity against curved objects, such as a bridge abutment, may be important. Accidents may involve multiple impact. In other words, there is a significant difference between test and design conditions and real accident conditions.

In addition, we stress that quality of actual casks and the handling of these casks will not correspond to theoretically considered systems. Failure of workmanship, such as failure to secure bolts properly on loading, may result in substantial loss of cooling water in a minor accident or even in the absence of a road or rail accident. In the latter case the loss would in many cases be unobserved, especially in the case of rail transport.

An important possibility is fire with or without associated impact. Fire could distort the cask or it could heat the coolant, causing its release. It could cause fuel rod rupture.<sup>4</sup> It could heat the spent fuel. Combustion gases could transport radioactive materials. In this report we are principally interested in the consequences of loss of cooling water.

To put this study in perspective, consider at turn of the century the typical prediction of 1000 LWR's in the 1000 Mw region which will involve about ten million miles per year of rail transport of large casks containing spent fuel, and/or 50 million miles of truck transport. Probabilities per mile of accident at various velocities and with various times of duration of fire have been reviewed by the AEC.<sup>7</sup> In a ten year period surrounding the year 2000, several rail accidents and/or several tens of road accidents involving casks would be expected with fires lasting well over one-half hour and/or impact at well over 30 miles per hour, as shown in Table I. Considering this and the possibility of faulty workmanship we conclude that accidents resulting in damage of category (2), as defined three paragraphs above, will not be unusual in a ten year period.<sup>8</sup> Furthermore, the loss of cooling water is a design basis accident considered by the AEC for water cooled casks.<sup>1,2,4</sup> The results of loss of cooling water accidents are the subject of the rest of this report.

## Appendix B-4

One uncertainty in an accident is the extent and degree of breakage of fuel pin cladding. (We are not interested in fuel pins which were perforated before transportation to the extent the available Cs was removed in core or storage pool.) The cladding is brittle after irradiation. An impact such that the cask is breached may or may not impart considerable physical shock to the pins. It is not surprising that different authorities differ on this point.<sup>2,4</sup> We assume that 10% of the pins will be fractured at the time of the accident. (This number is not critical in our final result.)

Table I

Expected Number of Serious Accidents in Transport of Spent Fuel Casks in Ten Year Period Surrounding the Year 2000\*  
(Based on reference 7)

Accident Severity Category	Vehicle Speed at Impact (mph)	Fire Duration (hr)	Expected Road Accidents	Expected Rail Accidents
"Moderate"	0-30	1/2-1	150	8
	30-70	< 1/2		
"Severe"	0-50	> 1	4	0.2
	30-70	1/2-1		
	> 70	< 1/2		

\*Very severe and more moderate accidents have been omitted.

In addition to possible damage to cladding upon impact and shortly afterwards, fuel pins which remain intact are subject to creep rupture at the high temperatures which develop after the cask is substantially dried out.<sup>9</sup>

Routes for Cs release associated with the two types of breach of cladding are shown in Figure 1. Of major interest is the amount of Cs which had already escaped from the fuel during irradiation. In typical LWR experience 30-35% of the noble gases escape from the fuel. Laboratory tests and calculations are the main source of information on escape of Cs. These can be correlated with rather limited direct evidence from actual reactor experience. The diffusion of cesium in sintered  $UO_2$  is slow at temperatures such as characterize the outer curved surface of the pellet, but is comparable or greater than that of the noble gases in irradiated fuel at higher temperatures as shown in Figure 2.<sup>10</sup> Some Cs will diffuse out of the pellet; most will remain in a cylindrical distribution very near the outer curved surface. See Figure 3.<sup>11</sup> The migration of Cs to the surface shown in this figure would be even greater at higher, typical burn-up levels. In one experiment it is stated: "The  $Cs^{137}$  migrated both radially and axially and in the case of the highest rated rod it is estimated that about 30% of the total rod inventory of  $Cs^{137}$  is deposited on the cladding."<sup>12</sup> As remarked here, the Cs which escapes from fuel pellets during irradiation condenses on the relatively cold pellet surface and inner wall of the cladding. The fraction escaping is sensitive to temperature and thus to location in the reactor. We assume that 20% of the Cs produced in the fuel escapes from the fuel pellet into the interior of the rod before transportation. Our final result scales with this number.

A further source of Cs escape from fuel is leaching of the fuel in those pins which are breached at the time of impact. If the outer  $1.2 \times 10^{-5}$  inch of the fuel pellets is leached,<sup>1,2</sup> 0.01% of the pellet volume is involved, and we conclude that about 1% of the Cs is leached on the basis of its high surface concentration. (This number is not important in our final result.)

## Appendix B-6

Under normal conditions in a large water cooled cask the temperature of the cladding may be in the range 320-460°F.<sup>13</sup> After substantial loss of coolant, the temperature of the hottest rod will ultimately rise to 1250-1500°F depending on the cooling off time of the fuel at the reactor and other considerations.<sup>9</sup> Similar calculations for the large IF 300 cask indicate the even higher hottest-pin temperature of 1576°F.<sup>4,13</sup>

The fraction of intact pins which ultimately rupture under these conditions, and the time to rupture, is discussed in the Cask Designer's Guide.<sup>9</sup> If the cooling off period has been short, e.g., 90 days, most pins are expected to rupture. If it is longer, e.g., 150 days, a substantial fraction of Zircaloy clad pins are still expected to rupture within 10 hours. For the hypothetical accident to be discussed, we assume 1/2 of all pins creep rupture.<sup>4</sup>

Two release routes appear most interesting: 1) For those rods breached at impact, Cs released from fuel during irradiation will dissolve in the cooling water and some more will be leached out of the pellet surfaces. Some of this Cs will be carried out of the cask with the steam and enter the atmosphere. 2) For those rods that creep rupture later, Cs released from the fuel during irradiation, if in volatile form, will enter the cask cavity as gas or an aerosol. The metallic Cs vapor pressure is high at temperatures well below its boiling point of 1253°F at one atmosphere. Some of the Cs free in the cavity will be carried out of the cask with further pressure releases by the cask.

1) Release from pins breached on impact: We have assumed above that 10% of the pins are breached and that 21% of the total Cs burden from these pins is taken up by the cooling water. As this water boils, a fraction of this Cs will be contained in particulates and escape from the

cask and be carried off in the atmosphere as the steam escapes. Unlike quiescent vaporization, the bursting of bubbles results in an aerosol which has roughly the same content of solute as the body of liquid.<sup>14</sup>

The fraction of Cs compounds entrained in the steam in the boiling process and escaping into the outer atmosphere is taken to be 10%. This may be a significant underestimate. (Our final result is not sensitive to this number.) The remaining 90% will be left on surfaces in the cavity. The product of these factors implies an escape of about 2,200 Ci of Cs into the atmosphere from a cask containing 3.2 MT of fuel.

2) Release after creep rupture of pins: We have assumed above that 50% of the pins creep rupture at high temperature, and that 20% of the total Cs burden from these has escaped the fuel pellets. We further assume that 1/2 of this available cesium is in volatile chemical form. The chemical situation is complex and is the subject of current research.<sup>15</sup> Thus 10% of the total Cs inventory of ruptured pins is assumed to go into the cask cavity atmosphere as a gas or aerosol. We do not explicitly consider further outgassing of the fuel as a source. There are three sources of mass flow out of the cask at this time: boiling off of any remaining cooling water, ultimate increases in temperature, and the gases released from the ruptured pins. The available fission gases per metric ton are about 300 liters STP which implies over 1/2 atmosphere partial pressure at conditions under consideration. The mass flow which will carry some Cs out and into the atmosphere will depend on particular conditions such as cavity pressure and the pressure release mechanism at this stage. On the basis of these three sources, we estimate that 10% of the Cs available in the cavity atmosphere will escape from the cask in pressure releases into the outer atmosphere. The product of these factors implies an escape of about 5,300 Ci of Cs.

## Appendix E-8

Dispersal of Cesium and Its Somatic Effects

In a loss of coolant accident involving a railroad cask containing 3.2 MT of spent fuel we have estimated a combined release of 7500 Ci of Cs (roughly  $2/3$  Cs<sup>134</sup> and  $1/3$  Cs<sup>137</sup>). This release may take place in intervals over a time of some hours. The problem of estimating the damage due to such a release is difficult because it depends in detail on conditions which will differ widely from case to case. Rather than examining all kinds of weather conditions and all population distributions we will examine two simple interesting cases.

First, we consider an individual 1 km downwind from the accident, remaining there while the radioactive cloud passes, or in a building with ventilation such that the exposure is the same. We consider stable weather conditions with a wind speed of 1 m/sec (about 2 mi/hr) and a low degree of gustiness such that at 1 km there is a vertical spread  $\sigma_z = 8m$  and a horizontal spread  $\sigma_y = 42m$ .<sup>16</sup> Thus the cloud would sweep out a volume like a long narrow plume (subtending an angle of about 1/10). We assume that the release is not carried high into the air by fire. (If it were, our second case below would be more applicable.) We assume that particulates are small and weather conditions are such that the Cs is not largely deposited out closer to the cask. The concentration of the cloud downwind at 1 km is then

$$\frac{Q}{\pi \sigma_y \sigma_z V} = 7 \frac{\text{curie-sec}}{m^3}$$

We only consider the dose to an individual associated with inhalation.

Breathing at a rate of  $3.5 \times 10^{-4} m^3/\text{sec}$  an individual would have an intake of  $2.5 \times 10^{-3}$  Ci. Assuming 75% uptake of Cs<sup>137</sup> and dose conversion of  $.86 \times 10^{-4}$  millirem for each picocurie uptake<sup>18</sup> (i.e. body burden) of Cs<sup>134</sup> + Cs<sup>137</sup> we find a dose commitment to the individual at one kilometer of 160 rem.

Assuming subsequent evacuation, we do not consider further exposure. Nevertheless, the radiation dose calculated is not received all at once, but is governed by a biological half-life of roughly 70-100 days.

At the dose level calculated, serious ill effects and some fatalities can be expected. A 300 rem sudden dose causes 50% fatalities.<sup>19</sup> The extended dose considered here would be much less lethal. Fetuses<sup>20</sup> and young children and other susceptible people<sup>21</sup> might be stricken. The ultimate dose of 160 rem implies a dose of about 1 rem/day for some time.<sup>17</sup> This would have significant impact on health with depression of bone marrow and lymphatic system and changes in immune responses. The probability of induced cancer within 25 years would be about 2%.<sup>20</sup>

The second case we consider is a windy, gusty day. Here it is most significant to consider the somatic effect of small doses of radiation suffered by people over a wide area and over a long period of time. Assuming the linear hypothesis, the BEIR report<sup>20</sup> concludes that the effect with respect to cancer of the sum of small doses averaging 0.1 rem/year to the population of the United States would be roughly 3500 cancer deaths/year (within 25 years).

According to analysis of Cs<sup>137</sup> from weapons testing the dose commitment conversion factor is 1.44 mrem/mCi/km<sup>2</sup>.<sup>22</sup> That is, a deposition at one time of Cs<sup>137</sup> at the level one mCi/km<sup>2</sup> results in a typical person living indefinitely in that environment acquiring a dose of 1.44 mrem from external decays. To calculate the dose due to Cs<sup>137</sup>, factors for shielding by buildings and body tissue, and for internal decays must be included.<sup>22</sup> The net result is a dose commitment factor of 0.67 mrem/mCi/km<sup>2</sup>. The internal decay dose depends on particular food chains and might not apply at the site in question; about 50% of the deaths quoted below are due to the external exposure alone. The dose from

## Appendix B-10.

$(1/3 \text{ Cs}^{137} + 2/3 \text{ Cs}^{134})$  is less than for the same number of curies of  $\text{Cs}^{137}$ . Using an effective mean lifetime of 14 years for  $\text{Cs}^{137}$  for external irradiation, we calculate that the  $\text{Cs}^{134}$ - $\text{Cs}^{137}$  mixture is .80 times as effective per Ci as  $\text{Cs}^{137}$  alone. The dose in man-rem is thus  $.80 \times .67 \rho Q$  where  $Q$  is the total Cs release in Ci and  $\rho$  is the average population per  $\text{km}^2$ .

Assuming a suburban population of 1000 persons/ $\text{km}^2$  distributed over a very wide region downwind from the accident the dose in man-rem resulting from the assumed Cs release of 7500 Ci is  $.40 \times 10^7$ . This implies roughly 700 added cancer deaths within 25 years according to the BEIR result quoted above. We do not consider effects other than cancer. The calculation in this second case has the virtue of being related to empirical evidence from fallout which integrates the dose from varied pathways under actual conditions.

Land usage will be compromised by deposited cesium. The deposit of  $\text{Cs}^{134}$  is governed by its half-life of 2 years and that of  $\text{Cs}^{137}$  by an effective mean-life of 14 years on the surface. The external dose considering shielding effects of buildings and body tissues associated with radiation from ground level  $\text{Cs}^{137}$  is roughly 33 mrad per  $\text{Ci}/\text{km}^2$  on the surface,<sup>22</sup> i.e., four  $\text{Ci}/\text{km}^2$  yields an external dose comparable to background. The impact of deposited Cs on crops is small, but the effect on milk and on meat from grazing animals is extremely large during the first six months or so of deposit. A maximum dose commitment of 8 rem per  $\text{Ci}/\text{km}^2$  of  $\text{Cs}^{137}$  is indicated for a child via the milk path.<sup>24</sup> About four times as much Cs is concentrated in a kg of beef as in a liter of milk.<sup>23</sup>

Conclusion:

A semi volatile fission product, in particular cesium, has been shown to present a serious hazard in transportation of spent fuel. The hazard is greater than that related to the noble gases and halogens at this stage

of the nuclear fuel cycle. Thus, with rather similar assumptions, a release of 850 Ci of Kr<sup>85</sup> is projected in a loss of cooling water event involving the IF-300 cask.<sup>4</sup> This amount of Kr<sup>85</sup> will have very minor impact compared to the cesium release discussed in the present report. There are a variety of possibilities for corrective action at this time. For example, two aspects of the release of Cs to which the amount of release is sensitive are the use of a fluid under pressure as heat transfer medium and the decay heat rate, which in turn depends on the cooling off period for the fuel. This latter aspect would appear to create an even more serious problem for transport of spent IMFER fuel. A more sweeping modification has been proposed to eliminate all problems associated with long range transport: geographical concentrations of nuclear facilities.<sup>25</sup>

Many of the assumptions made in this report are subject to great uncertainty and to variation from case to case. We have attempted to strike middleground between underestimating the problems or overestimating them. Some of the numbers estimated here are subject to considerable refinement through detailed calculation. It is hoped that these refinements will be undertaken.

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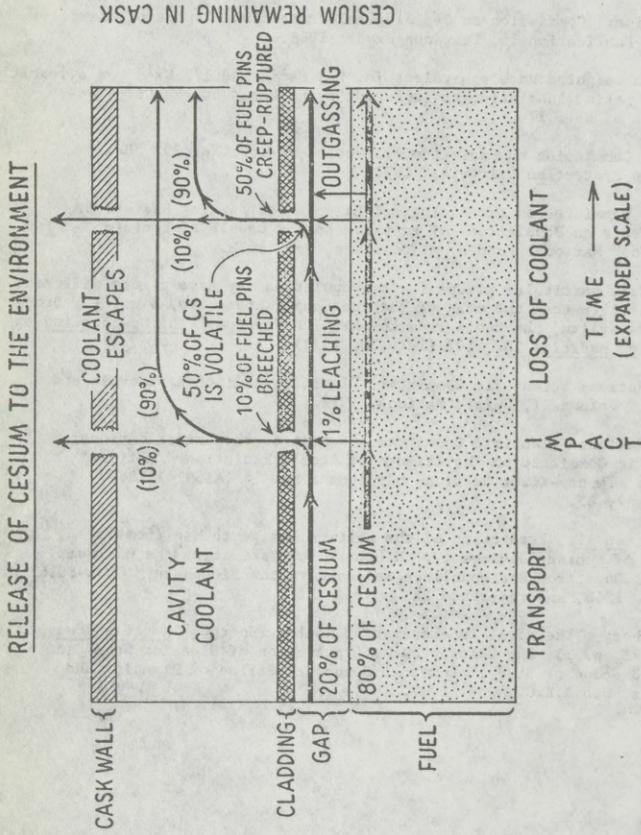


Fig. 1. Processes Considered on this Report.

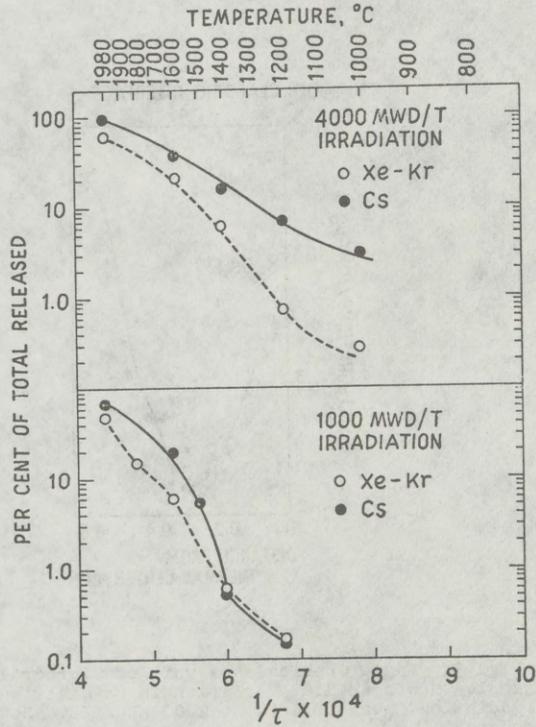


Figure 2. Release of Fission Products by Diffusion from Highly-Irradiated PWR-Type  $UO_2$  Heated 5.5 Hours in Purified Flowing Helium. Source, reference 10.

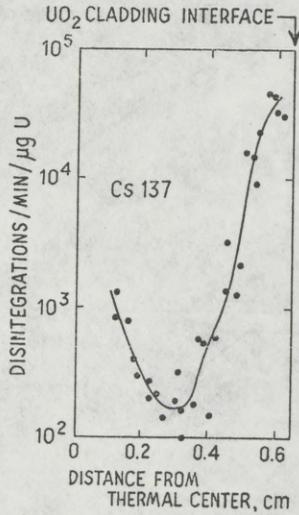


Fig. 3. Radio Chemical Analysis of Microdrilled  $UO_2$  Sample Showing Radial Variation in Cs Distribution at Irradiation Level of 1000 to 2000 MWD/MTU. Source, reference 11.

## APPENDIX C

## THE POSSIBILITY OF CASKS OPENING IN A FIRE

By Dr. Robert Blanks  
Professor of Chemical Engineering  
Michigan State University

There is a finite probability that sometime a carrier of radioactive materials might be involved in a vehicular accident. If this happens, one may question the hypothetical accident conditions established by the AEC and used to test and license radioactive material shipping casks. In particular, item 3 of the hypothetical accident, exposure to a 1475°F fire for a 30 minute period with no artificial post-fire cooling. Is this an adequate thermal test?

The melting point of series 300 stainless steels is 2550°-2650°F and of the 400 series 2700°-2790°F.<sup>1</sup> A properly designed weld should be capable of withstanding nearly the same temperature before melting. The lead lining in the cask would melt at 554°-621°F. However it should not rupture the cask by expansion if the cask is designed with proper pressure-expansion relief volumes. In any event, this lead melting would occur at the 1475°F test temperature, and thus the test should reveal any problems in this regard.

Thus the apparent question becomes: what is the probability that, in the case of a vehicular accident, the temperature of the radioactive material shipping cask would exceed 1475°F, or approach or exceed 2550°F, for a finite time period?

It is a very difficult and tedious problem to find an exact temperature distribution in a furnace of well defined geometry. To find an exact temperature distribution in an ill-defined outdoor area, such as the space confined by a bridge-underpass, would be difficult indeed. A great deal of experience, knowledge of surface conditions, radiating

## Appendix C-2

characteristic of the particular flame, convection effects, etc., would be required to predict temperature distributions on a rational basis.

It is possible, however, to predict the maximum theoretical temperature which is the adiabatic\* flame temperature. The adiabatic flame temperature for the following materials is in the range 3820°-4275°F: acetone, acrylonitrile, benzene, o-xylene, 1-3 butadiene, n-butane, ethylene oxide, heptane, isooctane, propane and toluene.<sup>2</sup> Such chemicals might be found in trucks on the highway.

The temperature of an object, the cask, in a gas space near a flame with an adiabatic flame temperature of approximately 4000°F will certainly be lower than 4000°F. How much lower? For continuous billet-reheating furnaces the gas temperature at the hot end of the furnace is approximately 0.75 to 0.8 times the adiabatic flame temperature.<sup>3</sup> This would result in a gas temperature of approximately 3000°F in a billet-furnace for the substances whose adiabatic flame temperature is 4000°F. For petroleum cracking furnaces, wall temperatures from 1500°F-1700°F were calculated or measured under certain conditions.<sup>4</sup>

Certainly the temperatures in a gas surrounding a burning fuel truck, and the temperature of a cask near the truck, would be different from those mentioned above in a well designed furnace. The temperatures would depend on the surroundings, circulating air patterns, enclosing geometries, etc. The temperature of the cask under most conditions would probably be lower than 1475°F. However, under certain circumstances, the temperatures of the cask could rise above 1475°F and approach or exceed the softening point of the steel cask. Apparently,

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\*adiabatic flame temperature means the maximum temperature the substance would reach if no heat was transferred away from it.

this occurred in the accident of January 1, 1971, as evidenced by the following police report which came from records of the Michigan State Police and the Fire Department of Flint Township:

On January 1, 1971, on a clear day with an icy road surface, a tractor-trailer truck carrying gasoline crashed under an overpass on I-75 near Flint. The fire which followed generated so much heat that the steel beams of the overpass 50 feet above the accident became bowed. The fireman's report stated "that chunks of concrete kept exploding off the bridge and falling down." They were afraid that the whole bridge was going to fall on the gasoline truck. The fire melted away part of the motor, the cab, the hood, and the front fenders. The tank showed four ruptures 18 inches long. The punctures at the rear of the rig could have been caused by one of the steel posts or metal signs along the roadway.

The damage caused by the intense heat to the structural steel of which the bridge was composed, closed this portion of the highway for several months.

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## APPENDIX D

## Credits and Thanks

Joan Anderson, University of Michigan senior and PIRGIM intern during the summer of 1973, contributed thorough and hard work in the researching of this report. PIRGIM owes thanks to the LS&A and Rackham Student Governments at the University of Michigan which sponsored her internship.

I want to thank many other public spirited citizens who have given of their thought, time, and labor in the public behalf. First of all, the many members of the distinguished faculty of the Michigan State University School of Engineering, whose advice and technical expertise made possible many key aspects of this report. In particular: Dr. William Taylor, chairman of the Department of Civil Engineering; Dr. Robert Blanks, professor of Chemical Engineering; and Dr. Frank Hatfield, professor of Civil Engineering.

Dr. Jack Williams, professor of Geography, with David Edwards, a student of cartography did the maps in Appendix A.

Dr. Martin Fox, professor of Statistics of Michigan State University, gave valuable advice on problems of statistics and probabilities.

Diana Lees, student at Michigan State University, and the members of the staff of the Michigan Highway Department Accident Analysis Division did invaluable research on the many truck accidents in this state.

Mark Goldstein, a student at the University of Michigan and a PIRGIM intern, and Carol Smith of East Lansing, followed a truck carrying radiation waste from the Big Rock power plant almost to the Indiana border.

And most of all, my thanks to Professor Marc Ross of the Physics Department who, with aid from Joan Anderson and the research help of Dr. Joel Leonard, a bio-engineer; Dr. John Davidson, a post doctoral fellow in physics, and John Gilligan, a graduate student in nuclear engineering--all of the University of Michigan--did the immense amount of painstaking research which has brought to light the problem the AEC does not want to face: the danger of radioactive cesium.

Although all of these people have given generously of their time and expertise, only PIRGIM and the author are responsible for the opinions and suggested policies advocated in this report.

Mr. CONLIN. Thank you very much, Mr. Chairman. I appreciate very much the opportunity to be here. I will try to make my remarks as briefly as possible, summarizing the paper which we have submitted on this. My name is Richard Conlin, and I am projects director for Public Interest Research Group in Michigan.

PIRGIM is a nonprofit organization created, funded, and controlled by the constituents of Michigan and I am on its professional staff and have been working on it in connection with energy policy.

The last 2 years, I have been directing our energy policy project. We have also, as part of that project as well as a number of other issues, been concerned with the nuclear issue as it has developed.

The testimony we are presenting today is based primarily on that research activity we have conducted over the past 2 years.

Our essential position is that the question of long-term storage disposal of radioactive waste should have been addressed 20 years ago when the problem might have been manageable. The problem is that it was not addressed then and because it was not addressed, we are faced with an extraordinarily serious and perhaps impossible situation at present.

The agencies entrusted with the responsibility of regulating this nuclear waste situation have in the past been consistently negligent in their duty.

Now, all different types of operations that produce or use nuclear materials generate radioactive waste. I have noted some of the particular problems that we face with radioactive wastes in my testimony just to highlight perhaps the outstanding problem, plutonium 239, which is a principal high-level waste product has one half life of 24,000 years.

That means that it takes at least 240,000 years, or 10 half lives, for a given amount to decay to a point of relative safety. Some scientists say as long as 20 to 25 half lives. Until that point, an ounce of plutonium is enough to cause several thousand cancers, again that is a very minimum estimate.

At this time there are approximately 55 million cubic feet of radioactive waste stored at 11 sites around the country.

A recent EPA study estimated that approximately 1 billion cubic feet of low-level waste will be stored by the year 2000, enough to cover a 4-lane coast-to-coast highway 1 foot deep, plus 80,000 10-foot steel canisters of high-level wastes which ERDA estimates it will produce.

All of these wastes present severe health hazards. The radiation they produce, we have no idea what a safe threshold would be; low-level doses may cause cancer and genetic mutations, some particles may be stored in body tissues, such as strontium-90 in the bones, iodine-131 in the thyroid, plutonium particles lodged in the lungs, and they may accumulate as a result of this kind of storage. We simply didn't know what the long-range consequences of either small amounts of radiation may be on human life.

These are some of the reasons why the proper containment and storage of radioactive waste is a crucial issue for us. Yet the record of the past has been inattention and neglect.

The Comptroller General of the United States noted in his report, "Improvements Needed in the Land Disposed to Radioactive Wastes—The Problem of Centuries," published in January this year. I want to quote this:

It is not known what mix of hydrogeological characteristics and engineering features offer the greatest assurance that radioactivity, once buried, will not migrate to create a possible public health hazard and require extraordinary and costly efforts to correct.

Furthermore, GAO found that site selection criteria have not been established, important earth science characteristics are not well defined, and some disposal sites now are releasing radioactivity to the environment.

And I would add the report further noted that:

ERDA disposal sites were selected mainly because the land was already federally owned, the disposal sites were convenient to the waste-producing activity, and the disposal sites provided a use for lands of otherwise marginal utility. For some of the disposal sites established in the 1940's, there were no geological evaluations.

And there are other violations which the report documents. And this has produced extremely grave consequences. At Maxey Flats, Ky., radioactivity has been leaking into the environment since 1972. This February, the Environmental Protection Agency discovered that plutonium was among the substances leaking: "Plutonium was detected in surface soil, in soil cores 90 cm deep, in monitoring wells, and in streams which drain the site."

There have been other leaks at West Valley, N.Y., at the Hollyfield facility, and Beatty site just revealed by the Nuclear Regulatory Commission. Finally, and most acutely, there have been a continuing series of leaks at the Hanford, Wash., waste storage site; cumulatively, in excess of 500,000 gallons of liquid waste, containing well over half a million curies of radiation, have leaked from the Hanford tanks; 6 of the 11 sites used for radioactive waste storage have leaks. Unfortunately, this is not the complete story.

Recognizing that its present storage sites could not be considered smashing successes, for many years the AEC and its successor, ERDA, have searched for a permanent waste storage site, in a stable geological formation where wastes could remain undisturbed for centuries. Candidates have been salt formations and twice they had thought they had the solution. In 1970, while the National Academy of Sciences Committee on Nuclear Waste was in Kansas City working on a report concerning the use of salt formations for the disposal of radioactive wastes. During this time, the AEC, without notifying the committee, announced a tentative selection of a salt mine near Lyons, Kans., as the initial site for the burial of radioactive wastes. After quick revision of the report which was in the process of being prepared by the committee, their final report came out favorable toward the use of salt mines for burying wastes in general, as the committee had said in the past, and tentatively approving the specific site, subject to the outcome of future tests. Those proponents of the Lyons site, notably the AEC, considered this an endorsement of the site, and spoke of it as such.

In March 1971, Milton Shaw, the Director of the AEC's Division of Reactor Development, told a joint committee:

Another year's work of research and development in this area on top of 15 years will not be particularly productive. We need the project and are ready to proceed with it. Moreover, we are convinced that the Lyons site is equal or superior to the others. The valuable data gathered there during our study is unique to the Lyons mine.

Yet, in September 1971, only months after this decisive announcement, the site had been found unacceptable. The AEC asked the Kansas Geological Survey and the Oak Ridge drilling consultant to look for other possible sites. The results:

Of eight areas considered, three were judged to have potential worth an investigation, four were deemed less promising, and the area which included Lyons was deemed the poorest candidate of all.

There were numerous reasons. Holes were found from past oil and gas exploration wells, some of which could not be plugged and thus left dangers of water being able to leak in. It was also found that there had been solution mining for salt nearby, a process which removes supporting pillars, thus creating the possibility that nearby areas could collapse and form a deep surface lake. Finally, the American Salt Co. had once tried hydraulic fracture technique in mining nearby. This process involves forcing water down one hole which dissolves the salt and brings it up a second hole. During this process, 175,000 gallons of water were misplaced somewhere underground. Neither the company nor the AEC knew where it was, leaving the possibility that it might be moving toward the proposed site. Upon learning of these numerous faults, consideration of the site was withdrawn. Yet this was the site which was once tabbed as the definitive answer and a perfect location for radioactive wastes.

Salt formulations in the Carlsbad, N. Mex., area next came under study as a possible site. Past oil and gas explorations found here also impeded initial progress and attention was shifted to another site in the area. An article in the Denver Post on October 13, 1975, revealed a confirmation from project officials that the second site was found to be "underlain by brine contaminated with toxic gases." Despite these twin setbacks, at the ERDA budget hearings it was stated that:

In fiscal year 1976, site selection investigations to more accurately define the geology and hydrology of the study area of southeastern New Mexico will be continued and a candidate site selected.

Now, these are the kinds of careful analysis and prudent decision-making which have been characteristic of Federal nuclear activities. And we have seen no evidence that splitting the AEC into ERDA and NRC have changed the perspective of the regulators; in fact, the same people are still staffing nuclear regulation; only the decisionmaking process has been muddled, to further confuse the public.

As far as we can determine, the selection of a nuclear waste disposal site will be made by both agencies, in that ERDA will conduct the investigations and then apply to the NRC for a license

to operate. If these were truly independent agencies, we might have some confidence in this split responsibility. But all one has to do is look at their press releases to realize that both agencies serve essentially as promoters of the nuclear industry. ERDA unabashedly pushes nuclear power, devoting over 50 percent of its budget to it, while the NRC has never denied a license application for a nuclear plant. The likely consequences of the present system, then, is as follows:

Each agency will disclaim responsibility for the final decision; ERDA will state that its work is preliminary, while NRC will then turn around and claim that it is merely following ERDA's recommendation.

Public anticipation will be correspondingly frustrated: people will troop from hearing to hearing, only to be told that they are in the wrong place; organizations and agencies will have to expend extra effort to monitor two procedures.

Because of the unclear division of responsibility, there will be a tendency to avoid issues and continue the past pattern of sloppy work.

We suggest two kinds of actions are needed: First, the procedure for waste disposal decisionmaking must be clarified, to eliminate the conditions that produced the disasters of the past, and prevent the future structure from being unresponsive to the public. We suggest the following:

(a) Enact a statutory process for decisionmaking, with a clear and truly objective decisionmaker—possibly the Federal judiciary—adequate provisions for public knowledge and input to the decisions, avoidance of the advocacy role of the Federal agencies presently involved, and full participation by representatives of affected agencies such as the Environmental Protection Agency, the U.S. Geological Survey, and public health authorities;

(b) Include provision for funding of technical and legal assistance to citizen intervenors in this process, to insure that ordinary citizens will be represented;

(c) Mandate State and local veto power over unacceptable plans, with a clear mechanism for exercising such vetoes, not just a vague suggestion that "the State would have input" or "the people will have the final say." We've had enough of glittering generalities and bureaucratic obfuscation. We want real influence over what happens in our own backyards and we want it spelled out now.

Second, besides these procedural reforms, we need to examine the production of radioactive waste and ask ourselves whether we're going to be able to handle increasingly large quantities and, if not, whether we ought to continue producing this waste. After all, the best way to control pollution is source reduction. We suggest the following:

(a) Require that a safe and assured method of waste disposal be developed before we proceed with a massive investment in nuclear power facilities. It would be a sad tragedy for us to commit so many resources to such a shaky technology, only to

condemn ourselves and future generations to cancer and genetic damage for many centuries. Let's take a conservative viewpoint on this issue, and be sure we're right before we go ahead.

(b) Finally, save the taxpayers several billion dollars annually and clarify our whole energy picture by abolishing both the Nuclear Regulatory Commission and the Energy Research and Development Agency. I recognize this is somewhat a long-term aspiration. We don't need to spend this money promoting nuclear power; it could do a lot more good spent on alternatives. The NRC functions should be put where they belong, with the Environmental Protection Agency, and ERDA's research functions could be absorbed by the National Science Foundation, or some other similar and more objective agency.

Let me conclude by saying that the question of disposing of radioactive wastes in Michigan is one of the utmost gravity for Michigan citizens. Decisions must be made openly, objectively, and without bias. We urge you to sponsor legislation embodying our recommendations in order to provide real solutions for these problems and prevent the bureaucratic nuclear promoters from riding roughshod over public health and safety, as they have done in so many other situations. Since we cannot depend upon ERDA or the NRC to provide adequate safeguards and real regulation, we must turn to you, our elected representatives.

Thank you very much.

Mr. CARR. Thank you, Mr. Conlin, for the preparation and delivery of your statement.

I would just like to ask you a few questions about your last remarks.

Mr. CONLIN. Yes.

Mr. CARR. For many years the complaint was that there was too much concentration of power in the AEC and they had the dual and conflicting role of designer of policies and regulator. Now we divided it, and that was a call made by people such as yourself. I don't think we have ever had that specific conversation, but people like yourself and groups like the Public Interest Research Group in Michigan who for years called upon the Congress to divide the responsibility so there wasn't that conflict of interest. Now, you are saying, apparently, that that has not worked and we ought to abolish those two agencies and ought to put the responsibility somewhere else.

I have a frustration with the Federal Government and its bureaucracy and the insider perspective of the agencies. But after all, are you not just proposing that we chase this thing around? Is it really going to get any better if we put it in other agencies? After all, the power of information, the money that is generated behind the nuclear interests will pursue the decisionmakers wherever you put them, won't they?

Mr. CONLIN. Yes, I think you may very well be right. I don't want to emphasize that. I think that is a long term question that we have to address about the future of nuclear power development.

I would emphasize the other steps that we suggest relating to this particular issue. I think that to react to the problem, what we really have—I agree with you it has long been an aspiration to have the promotion and regulation split. The problem is right now that the transfer has been made exclusively on paper. That is the same people staffing the AEC are now staffing the NRC and ERDA.

What we are reacting against is the illusion that that is solving the problem. It hasn't.

When I suggest perhaps making another transfer of functions that again may offer the same possibility. Again, the same people may pursue the functions on into a new agency.

The real question that I would raise is that if regulatory authority were put in EPA for example, would the leadership of EPA in the broad responsibilities that EPA has provided a balancing to those special interest advocacy on the part of specific individuals?

We suspect it would provide a better situation than the present situation. In that context, I think it would be useful.

I think what we are principally addressing though is the fact that the priorities are set by ERDA, continue to be exclusively massive promotion of nuclear power, they give lip service to other technologies, but they simply don't put the investments into it and the priorities set by the NRC is to cover up problems and ignore them wherever possible.

Again, we don't think those are adequate responses.

Mr. CARR. Well, I just wanted to—that structural thing is a real problem in everyday life whether we are dealing with nuclear matters, consumer matters, commercial matters, whatever it is.

Mr. CONLIN. Sure.

Mr. CARR. The agencies get an insider perspective and I don't know how you defeat that under the present structure of our Government. I don't think you have provided—you can ameliorate the condition somewhat by providing more input as you say—public interest advocacy and a few other things, but when all is said and done, the power is money and the money can generate information and the information and knowledge becomes a driving sort of force rather than a contributing influence.

And I share your frustration.

I just wanted to also again speak to the statement, issue a statement, to those who may be in the room, that this subcommittee has jurisdiction of oversight of nonmilitary nuclear policy only. It is only oversight. We do not have legislative jurisdiction. While we hope that our oversight hearings will generate ideas and generate legislation, we stand frustrated by the fact that what we learn we can't apply except inasmuch as we might want to introduce a piece of legislation that is shipped off to another committee that hasn't been privileged to sit through the fine presentations that we have.

So we have a rather disjointed situation in the Congress as well. Congressman Ruppe, I yield to you at this point.

Mr. RUPPE. Thank you very much.

Thank you for a very interesting statement. How do you view Representative Jondahl's proposal to require a certificate of public convenience and necessity with the approval of the legislature before a nuclear waste disposal facility can be built in our State?

Mr. CONLIN. I think that would be an excellent means of addressing the problem. We would be strongly supportive of such legislation. I think the measures that he is proposing would provide some adequate safeguards. That is extremely important, providing both a mechanism in which there is adequate input by agencies, not just the Governor, but the Public Service Commission, the legislature, and also a mechanism for citizen input to make sure that hearings are open and there is a deliberate decisionmaking process.

Mr. RUPPE. There doesn't seem to be the final word as to how the decision process will be reached, whether the State, its Governor or its agencies, will have a measurable input in any final decision; whether local people and their elected officials will have a major voice or even the final decision. That is all pretty fuzzy at this particular time. ERDA's correspondence with me has certainly not led me to believe that they have formulated a firm policy or publicized one if they have one in that area.

Mr. CONLIN. That is one of the things we find most frustrating, that it is lack of clarity.

Mr. RUPPE. Back in the 93d Congress, I helped write the ERDA legislation. As I recall at the time, organizations like yours were rather supportive of the bill itself in view of the fact they wanted to split from the old Atomic Energy Commission, the development function which is now in ERDA, and the regulatory function which is in the Nuclear Regulatory Commission at the present time.

I don't follow the work of the NRC, but it seems to me that ERDA has the overall responsibility for developing all forms of energy in the United States, and I think carries out that mandate. It seems to me if they are putting too much effort in the area of nuclear power, it wouldn't be totally wrong for them to do so.

I would think that the Congress through the appropriations process as well as through the authorizing committees can and should direct ERDA as to what type of dollars to put in what type of research area.

I think when they picked up the development staff and scientists from the old AEC, they probably went into this business with a heavy nuclear budget and with perhaps a measure of bias towards nuclear research. But certainly that bias and that nuclear effort can be and should be changed by the administrator perhaps, but certainly by the Congress in terms of the type of funding and direction they are given, when their annual budget comes due.

So, I don't know—I am less inclined to fault ERDA perhaps and more inclined to suggest that the administrator or even, say, the Congress and the executive branch, the President, in his budget

proposals should come up with a better mix of research for that organization.

Mr. CARR. Would you yield on that point?

Mr. RUPPE. Sure.

Mr. CARR. I think we do bear some responsibility in the Congress. I recall back last year when we in the same week we managed to add an amendment to increase funding authorization for solar energy by a measly \$50 million as I recall, and later on in that same week we were defeated on the appropriations bill on the same authorization. It was a quick 3-day turnaround for the forces of nuclear to defeat the solar alternative.

Happily, this year we were able to add more money for alternative, nonnuclear alternatives to energy and we were successful.

But I agree with you, that the Congress has a major responsibility of forcing ERDA into looking at other alternatives.

I thank you for yielding.

Mr. RUPPE. I would consider myself remiss if I didn't ask you, would you consider your organization proponents or opponents of nuclear power?

Mr. CONLIN. That is an interesting question.

Mr. RUPPE. As they say in the courthouse, yes or no?

Mr. CONLIN. Our position has been that we think the risks right now are not clear. Safety standards are not clear, the economics are not clear. Legally those questions have to be answered before we proceed any further with development of nuclear power.

We don't exclude the possibility of this in the future, that it might be a safe and economical source of energy. But at this point, we are convinced that the evidence is that it is not.

Mr. RUPPE. That is a fair response.

Mr. CONLIN. Thank you.

Mr. CARR. Thank you, Mr. Conlin. We have benefitted from your viewpoint.

Our next witness and I think we made up some time now, and I don't want to cut off any questions or put off any statements. I just would remind the witnesses that we want to provide a maximum amount of opportunity for everyone to have a say to the extent you can skip over statements in your prepared text that might have some redundancy. We would appreciate it. Your fellow citizens want an opportunity to speak and they would appreciate it, also.

Our next witness is from the EPA, Deputy Assistant Administrator for Radiation Programs, Dr. Rowe.

Welcome to our hearing here in Lansing on the topic of nuclear waste storage. We welcome you and are grateful for your time and attention to this hearing.

I note that you have a prepared statement and if it meets with your approval, I would like to ask unanimous consent that it be introduced into the record and provide you an opportunity to proceed in any manner that you feel you wish.

STATEMENT OF DR. WILLIAM ROWE, DEPUTY ASSISTANT ADMINISTRATOR FOR RADIATION PROGRAMS, ENVIRONMENTAL PROTECTION AGENCY

Dr. ROWE. Thank you, Mr. Chairman, and members of the committee.

It is indeed a pleasure to be here in Michigan. After hearing the previous witness, I ought to state my qualifications: I am not a nuclear engineer; I come as an environmentalist; the role of the Environmental Protection Agency in radiation is overall radiation protection aimed at protection of public health and the environment and we are neither for nor against nuclear energy, except for our concern that any form of energy meet acceptable environmental public health criteria.

With that introduction, I do have a few extra copies of my prepared remarks for the press if they would like them.

I will try to paraphrase some of the things that are in my statement to keep it short. First I will attempt to describe the role of the EPA in waste management and then I will be happy to answer any questions that the committee might have.

In the beginning, let me point out that EPA has no direct regulatory role in the disposal of high level radioactive wastes in geological formations and therefore we have no regulatory role regarding any specific Alpena site.

However, our role for assuring health and safety and environment protection for all waste disposal efforts is another matter. EPA is responsible for developing overall environmental criteria for all waste management options.

The authority for developing such criteria comes from a number of legislative sources and Reorganization Plan Number Three of 1970, which originally set up EPA.

We have the authority to establish generally applicable environmental standards for the protection of the general environment from radioactive material, and to provide broad guidance for all aspects of radiation protection formerly addressed by the Federal Radiation Council, both of these established under the Atomic Energy Act.

We also have mandates under the Marine Protection, Research, and Sanctuaries Act of 1972, to regulate the disposal of radioactive waste in oceans, and this includes issuance of dumping permits; under the Federal Water Pollution Control Act of 1972, for effluents involving radioactive materials not controlled under the Atomic Energy Act; and under the Safe Drinking Water Act of 1974, for any contamination of water that is used as drinking water in a community water supply.

As we carry out our responsibilities we have three steps that we undertake. The first of these is to develop fundamental environmental criteria.

The second step is the development of generally applicable environmental standards for classes of waste and disposition alternatives.

None of these standards or criteria will be site or method specific. That is left to NRC and ERDA.

The third step is the development of standards and regulations in the areas where we have specific regulatory authority, such as under the Ocean Dumping Act.

In the first step, namely that of fundamental criteria for waste disposal, we plan to complete initial development of the fundamental environmental criteria by early 1977.

These criteria will be comprehensive, that is, they will address all types of radioactive waste. EPA has always viewed radioactive waste management in the broadest perspective and does not limit its consideration to only those wastes resulting from the production of nuclear power. The EPA criteria will address several difficult issues.

The first issue is the definition problem. There is a real need to clearly define the terminology used in waste management so that discussions can be held on a common basis.

The second difficult issue involves the implications of the long-term impact and the adequacy of institutional and technological approaches and limits which are or can be made available to solve this problem.

The third difficult issue is the problem of characterizing the risk of waste management and evaluating the methods for risk acceptance in waste disposal.

The risk in waste management includes consideration of natural and manmade accidents, similar to those from reactors, and long-term risks, similar to those involved with the disposal of persistent chemicals, and pesticides, and heavy metals.

These are the real problems in waste disposal. These criteria will be developed with full public and governmental participation.

We will also follow the environmental assessment process under NEPA and we will carry out our role to review all environmental impact statements to assure sites, such as Alpena, meet environmental criteria specified.

In developing our criteria for radioactive waste management and carrying out our regulatory roles in ocean disposal and natural radioactive waste areas, EPA's underlying philosophy is that waste management means containment of radioactive materials until they have decayed to innocuous levels.

The objective is to minimize exposure to present and future populations to avoid dilution into the biosphere. Containment may involve burial, storage, or some form of assuring that dispersion into the biosphere does not take place.

Briefly, and I know you are pressed for time, I will try to cover the various programs we have for different aspects of waste starting with high level.

First of all, the high level problem is already here, it is not in the future since we already have an appreciable quantity of high-level wastes for which no terminal disposal repository is available, and because there is considerable concern in the public arena over the feasibility of environmentally satisfactory disposal of "radwastes."

The Nation is faced with an urgent need for a solution to this problem. The question, then, is not if, but when, will we have an acceptable, ultimate disposal method, how good it will be, and how much will it cost.

EPA believes the rapid development of at least one demonstrated environmentally acceptable method for the permanent disposal of radioactive wastes is essential for the continued development of nuclear power.

The first method may not be the one ultimately or exclusively used, but it should demonstrate that waste can be contained in terminal storage in an environmentally sound manner.

Better and more cost-effective methods can follow.

There has been a great deal of interest especially here in Michigan, in high-level waste. The problem of low-level waste is one that EPA has been addressing since we consider the low-level waste perhaps even a bigger problem.

In conjunction with the U.S. Geological Survey, we have been developing environmental pathway models for assessment of dose to man from any site.

We are developing generic predictive pathway models for disposal sites. We are able to use these models to establish generally applicable standards for shallow land burial of radioactive waste, and to indicate when remedial or corrective actions should be taken.

Another kind of waste that we are concerned with is that involving transuranium elements of waste.

We have concluded that previous shallow surface burial methods for disposal of radioactive waste cannot be considered a satisfactory disposal method for low-level wastes containing small quantities of interspersed long-lived wastes, such as plutonium and other transuranics.

We believe it is necessary to place a high priority on establishment of regulations controlling the burial of transuranium waste.

We strongly supported the AEC-proposed rulemaking published in 1974 which would prohibit the burial of the long-lived transuranium waste by shallow landfill methods.

Another problem is decommissioning. When we are through with nuclear facilities, what do we do with them? We are now trying to assess the problems of decommissioning all nuclear facility types and how we will take care of them in the future.

In ocean disposal, we will expand our regulations, and will implement packaging criteria and requirements.

At the present time, our regulations for disposal in the ocean are such that any low-level radioactive materials condensed for ocean disposal must be contained, and the containers must last long enough until the material has decayed to innocuous levels. Ocean disposal of high-level wastes is presently prohibited by law.

We have a number of survey programs to see how well old "rad-waste" disposal sites have been making out; and we have undertaken a number of undersea expeditions to revisit some of these sites to see what some of the problems are.

Based upon these surveys, we are getting a better understanding of the waste problems in the ocean, and we feel that we can develop regulations for short-lived radioactive material that could be disposed of in this matter if anyone wants to dispose of them.

There is no low-level waste being disposed in the ocean by the United States at this time, although there is internationally. What we do has a great effect internationally; therefore, it is important for us to influence the international behavior of ocean dumping since the oceans belong to all of us.

We are also concerned with naturally occurring radioactive wastes which comes from a number of different sources, such as uranium milltailings and those generated by nonnuclear energy sources, such as mining of phosphates, coal, and other minerals.

Based on any need resulting from these assessments, we are developing Federal guidance and radiation criteria for implementation by the appropriate regulatory agencies.

We believe that effective and efficient solutions to all problems in radioactive waste disposal areas will require close coordination and cooperation among all agencies involved. In this regard, EPA already has participated in meetings with ERDA, NRC, CEQ, and USGS to lay the groundwork for the development of a consolidated national radioactive waste disposal plan. EPA's role in this plan will be the development of performance criteria for the containment and control of radioactivity from waste disposal sites.

Let me conclude by reiterating the key points.

First: From the environmental protection standpoint, EPA is concerned with proper management of all types of radioactive wastes.

Second: Our objective is one of containment rather than planned release and dispersion.

Third: EPA recognizes the need for environmental criteria for waste management, and we are implementing a program to provide this guidance on a timely basis.

Consideration will be given to the many key issues involving the long-term risk, the impact on future generations, the nature of environmental standards, and the public acceptance of the methods used in making decisions concerning radioactive waste management.

That ends my prepared remarks.

Mr. CARR. Thank you, Dr. Rowe.

I would like to discuss with you that part of your statement beginning on page 7 when you are talking about how you are coordinating with the other agencies.

As you have heard the testimony before us today, there is some concern about whether we have a clear-cut decisionmaking process or whether this is just sort of a hodge-podge ad hoc who can call on the phone and find out what was going on.

Certainly, Congressman Ruppe's experience was not particularly comforting from the fact that he was unaware of something that was going on in his own district. He might have some participation as its duly elected Representative there.

I would like to know to what extent EPA is privy to the plans of, or the R. & D. programs of ERDA and its nuclear waste management programs.

Do you get into that?

Dr. ROWE. Yes, we are working with CEQ, ERDA, NRC, and OMB, and USGS, jointly, in developing an overall waste management program for all forms of waste.

Mr. CARR. Is there a task force of some kind in all those agencies?

Dr. ROWE. Yes, there is.

Mr. CARR. Who heads that task force?

Dr. ROWE. It is being run presently now by OMB.

Mr. CARR. Good.

[Laughter.]

Mr. CARR. Is there a formal connection between EPA and ERDA?

Dr. ROWE. Yes, through this task force for planning purposes only.

Mr. CARR. Only through the task force?

Dr. ROWE. Yes.

We, technically, interchange information but each of us has independent roles.

So, in getting together on this task force, our independent roles are maintained. We each establish what our sequence of events will be. ERDA is undertaking to develop technological solutions; but that is only part of the problem; there have to be institutional solutions as well.

EPA and NRC are trying to help develop the institutional solutions, namely, what will the standards be; what will the regulations be to assure that the proper technologies are selected in a timely manner; and will the alternatives selected be acceptable?

Mr. CARR. Let me ask you, what kind of formal procedures does this task force have?

Do you submit papers to one another and have votes on them, or is it a clubby thing where you get together and kind of I will scratch your back if you scratch mine?

It would seem that EPA will be outvoted in a council of people like OMB, NRC, ERDA, and the rest.

Dr. ROWE. I would say we have some allies in CEQ and the USGS so we are not alone in this. The problem is not one of giving away any of our regulatory authorities. It is one of saying: "Here is what we are doing; here is what we have to do, now how is this going to affect you."

For example, we have said we have to develop environmental criteria; and we have said that environmental criteria have to be available before ERDA's generic impact statement comes out.

So, by sitting down together they have said: "Here is when we plan to have our impact statement ready," and we have said: "All right, now here is the timing that we need to develop our environmental criteria."

So, we have laid out the interrelationships so they all seem to begin to knit together into an overall program. It does not mean

that we have given away anything. More importantly, we have established the fact that these criteria should exist prior to having the generic impact statement come out.

Mr. CARR. Mind you, I am all for communication and coordinating and trying to knit things together. What I am asking you, though, is when the push comes to shove, how do you finally make a decision.

Do all the constituent parts of this task force have a veto?

Dr. ROWE. No, sir. The environmental criteria, for which we are responsible, are developed and promulgated by the Administrator of EPA.

Now, certainly, to get there we will go through a due process, which includes input not only from all the other agencies but from the public and industry as well.

Mr. CARR. OK. I understand that. Now we are in the task force. ERDA comes over and puts his arm around you and says: "I know that you did this and you did this in your jurisdiction and with sincerity and conviction and all, but it is just a little unrealistic because, look at this; now what is going to happen".

Does EPA sit there and say, "No, that is it, that is our decision and we are sticking by it"?

Dr. ROWE. Let me suggest one thing. This task force is a temporary one. It will go out of business as soon as we have an overall Federal plan agreed to. Its only purpose is for planning; it has no jurisdiction over our roles, the technical content of what we do, or anything else. It is simply to assure that here is ERDA's plan; here is NRC's plan, here is EPA's plan and that they fit together.

Mr. CARR. I understand that. I don't want to belabor this.

Dr. ROWE. There is no other role involved.

Mr. CARR. I have a little anxiety about this kind of planning. It is good; you can't limit it; I don't want to limit it, but I just want to let you know that as one member of this committee I am a little anxious about planning being used as a guise for a chipping away responsibility or for influencing responsibility.

I want to then make sure that EPA is exercising its full responsibility notwithstanding what OMB says.

I have had so many run-ins with OMB and how they ride over the agencies and tell them what to do and modify the regulatory authority and when that budget director sort of comes down and lays a heavy hand on the shoulder of any agency administrator and says, "Now, Charlie, let's be realistic about this thing; what you are proposing is too costly or what you are proposing is going to cause additional costs someplace else."

That is a heavy influential hand and I just want to let you know that I am all for coordination and communication but let's not make that additionally compromise the legislative and congressional mandate.

Let me just quickly run over some of the other questions I had down here.

To what extent will EPA be involved in the selection process of specific sites?

Dr. ROWE. Only that when an environmental impact statement is prepared on a specific site. We will comment on that statement. We are not directly involved in any site-specific legislation except in the oceans.

Mr. CARR. In regard to the oceans are you involved in the Law of the Sea Conference regarding this?

Dr. ROWE. Yes, we are.

Mr. CARR. All right

Dr. ROWE. In fact, we will be testifying on this I think before your committee on July 26 in detail.

Mr. CARR. All right.

At this point I will yield to you, Mr. Ruppe.

Mr. RUPPE. Thank you very much, Mr. Chairman.

I certainly appreciate, Dr. Rowe, your testifying here this morning.

As I understand it EPA has no direct responsibility or authority as far as the test drilling program is concerned?

Dr. ROWE. That is correct.

Mr. RUPPE. None at all. Okay.

In their letter to me on July 2, CEQ indicated that although ERDA's existing regulations for implementing NEPA provide for an environmental assessment to determine whether or not a full EIS will be written, no such assessment has been initiated.

Can you tell me, is there a regulation or any statute that directs Federal agencies to establish internal guidelines and then follow them, whether writing environmental impact statements or environmental assessments?

Dr. ROWE. Only under the National Environmental Policy Act of 1969, and subsequent court decisions which have indicated that such a policy must exist. Those are the only two directives involved that I know of.

Mr. RUPPE. Apparently ERDA has a requirement that in situations such as the one we have this morning that an environmental assessment be prepared, but apparently someone in that agency made the determination that they were not going to do so as far as this program was concerned.

Would they be in violation by not doing it of any Federal regulation or statute or do you feel they have the discretion to apply the internal requirement of an environmental assessment at their discretion or whim?

Dr. ROWE. I am not a lawyer, but I will say that I think the whole NEPA process is in itself an advisory process, that certain steps must be followed, one of them determining whether there will be environmental impact. When an agency makes a decision we can certainly challenge it on the correctness of his decision by making a review of it. But once he makes that decision, having gone through the alternatives in some prescribed way, I think he meets the qualifications in the act.

Mr. RUPPE. Doing nothing certainly does not meet any particular statute qualifications or requirements.

Dr. ROWE. No, I think he must go through certain procedures, but those procedures including a cost-benefit analysis as required in the Calvert Cliffs decision, for example, have to be undertaken. The law doesn't imply that the method or the outcome that is selected can be challenged formally.

Mr. RUPPE. My concern here was that the agency has an internal requirement for the preparation of an environmental assessment and simply chose to ignore their own internal requirement.

Had they developed or if in the future, as they indicate they will, they do develop an environmental assessment, does CEQ comment on that or do you have to wait until the decision is made to do an entire environmental impact statement and only on the basis of the full environmental impact statement can you comment?

Dr. ROWE. We comment both formally and informally on the basis that if an environmental impact statement is being considered, we will put our two cents in.

Mr. RUPPE. In an assessment paper?

Dr. ROWE. Yes, we will. Usually, we have been on the side to say that it is necessary.

Mr. RUPPE. So, in your opinion environmental statements should be completed now or before the test drillings commence for the start of what might be a nuclear waste disposal facility?

Dr. ROWE. My answer is that should they undertake something which is more than exploratory, my answer is yes. I think at the present time they are simply in an exploratory situation trying to gather technical information. I don't know whether such exploratory efforts involve environmental impact since I have not gotten into the area of what this drilling means.

Mr. RUPPE. It is hard to believe that that is the only area of the shield which they know so little about, so that they would hardly conduct their own ERDA test program in that one part.

It seems to me it is a great deal more site-specific than their response to me would indicate because they would not otherwise be undertaking a program to get a better knowledge of the one miniscule part of the whole shield, which is not available to them.

Dr. ROWE. As I understand their program, they are looking at a number of different sites. This was picked as one promising site and—

Mr. RUPPE. But in their statement to me they say they don't have any knowledge.

They are looking into this area because they don't have full knowledge and I quote, "But geological information available on certain areas in Alpena, Montmorency and Presque Isle Counties was relatively sparse."

It seems to me if they have better knowledge of the rest of the shield they would not have to go into here at all.

Dr. ROWE. I don't know, I can't answer that.

Mr. RUPPE. One last question: In this disposal area, apparently there is the requirement or the need to have safe disposal of waste and efficient disposal of transuranium waste; is that correct?

Dr. ROWE. That is correct.

Mr. RUPPE. They both require careful attention and they require subterranean storage.

Is there a difference in the techniques to be used in storing fissionable material versus transuranium waste such as plutonium waste?

Dr. ROWE. There may be. It is not absolutely certain.

Let me characterize the fission waste as being relatively short half-life but also thermally hot.

Mr. RUPPE. Yes.

Dr. ROWE. The transuranics, which have very long half lives, are not thermally hot. In fact, as alpha emitters, they are easily shielded. Therefore, the idea of separating the two has been considered—it is called partitioning—and involves looking for alternate disposal means for each.

A conference was held on the subject of partitioning about a month ago in Seattle and the results of it indicated that there isn't too much to be gained from partitioning, although it is still a subject for consideration. The problem is that in the separation processes you sometimes generate more wastes and more waste volume than you had when you began. So, it is not an easy thing to do. Nevertheless, it is being considered.

On the other hand, there are a number of transuranic wastes which are already separated which did not come from the processing system directly and these we think should be separated and treated differently.

Mr. RUPPE. Is the transuranic waste that contains plutonium a measurably different waste by virtue of the plutonium within it or do you feel as perhaps you have just indicated that it can be handled as part of an ordinary waste disposal process?

Dr. ROWE. Well, I—

Mr. RUPPE. In other words, is there anything special in the way you handle plutonium or the way it might react?

Dr. ROWE. There are two or three things about plutonium that we are concerned with.

One, if you have too much of it together you can certainly have a critical mass and have a reaction. So, you have to make sure that you keep it well dispersed in a storage location.

Secondly, plutonium which can be removed is a safeguard problem. Plutonium is something that could be separated by somebody who was perhaps trying to make a weapon for some reason.

So, except for very low levels of plutonium contamination where you have to process so much material it wouldn't be worth doing, that's always a consideration.

The toxicity of the plutonium should it get to the environment must be considered. Plutonium is toxic; perhaps a bit more toxic than radium, which is found naturally but it is a toxic material and has to be handled as such.

Mr. RUPPE. Thank you.

Thank you very much, Mr. Chairman.

Mr. CARR. One final question, Dr. Rowe.

Do you think that EPA has all the authority it needs to meet the challenge of nuclear waste storage?

Dr. ROWE. That's always a difficult question to answer because our authorities are very general and we have no regulatory role. However, our influence up to this time has been very considerable. I think we have brought attention to the waste management problem, and are continuing to bring attention to it. Further, we will develop our environmental criteria. It will be a difficult job and we will be beset by everybody as we do it.

We firmly will hold out to do so. Whether we should have more specific authorities or not, that is another concern which I have not really thought about in any great detail yet, but it is certainly one that would be worth considering, especially in the area of wastes containing natural radioactivity where there is no present overall regulation. The Atomic Energy Act and the Energy Regulation Act of 1974 cover only "source, special, and by-product materials," and not, for example, radioactive wastes produced in processing phosphate ones.

Mr. CARR. If you would care to give some thought to that and communicate that to the committee, we would be glad to include it in the record and reflect on your recommendations.

We know you to be a friend of the committee and we want to thank you very much for your time that you have taken to journey here to be with us in Lansing, Mich., from Washington, D.C. and bid you a safe return.

Dr. ROWE. It certainly was my pleasure to be here in the interest of both the citizens of Michigan and the public at large.

Thank you, Mr. Chairman.

Mr. CARR. Thank you.

Mr. CARR. Our next witness is a man known throughout Michigan for his fine work in the area of conservation on behalf of people interested in a good, clean, healthy environment, Mr. Tom Washington, executive director of the Michigan United Conservation Clubs.

I would like to welcome you to the hearing we are holding here in the field in Lansing and I notice that you have a prepared statement, and if by chance you were not in the room when I was discussing the prepared statements with Dr. Rowe and with your permission, too, and without objection, I would like to insert your entire statement into the record and allow you to proceed with freedom to skip over, delete, include the entire remarks, if you wish.

[Prepared statement by Mr. Washington follows:]

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Helen Pearce: 71 Edwin Court, Colowater, Michigan 49037

COMMENTS OF MICHIGAN UNITED CONSERVATION CLUBS  
RE: NUCLEAR WASTE DISPOSAL IN NORTHEAST MICHIGAN

Public Hearing  
House Interior Committee - Energy & Environment Subcommittee  
July 6, 1976 - Lansing, Michigan

Michigan United Conservation Clubs appreciates this opportunity for public comment early in the decision-making process on a proposal with tremendous environmental and social implications for the State of Michigan. The internment of nuclear wastes under our state poses immediate and long-term questions which should concern all Michigan citizens. We view this hearing as the start of an open dialog between the state and federal government and as an opportunity for the Energy Research and Development Agency (ERDA) to at last provide some concrete answers to obvious questions concerning the nuclear industry.

MUCC has taken no position in the past concerning development of nuclear energy; we have not opposed construction of any of Michigan's existing nuclear power plants, nor the Midland plant scheduled to go on-line in 1981-1982. This is not to imply, however, that we do not have a continuing concern about the future of the nuclear industry in our nation and state. If there are benefits, we will reap them; if there are costs, we will pay them; if there are risks, we must live with them.

We are going to have increasing numbers of nuclear power plants in the United States. The defeat of Proposition 13 in California, the so-called Nuclear Safeguards Initiative, is one more indication to us that the people have opted for continued reliance on an expanded nuclear technology to supply at least our near-term energy

STATEWIDE

*"To Further and Advance Conservation in All of Its Phases"*

needs.

Nuclear power will provide a substantial portion, perhaps 40 percent, of our future energy demands. It will also provide us with increasing amounts of high-level wastes. Permanent storage facilities are essential for continued growth of the nuclear industry.

MUCC does not oppose further studies to determine the feasibility of a nuclear waste disposal site in our state. Most of us wish the problem of radioactive wastes would just go away, but of course it will not. Michigan has a responsibility to carry our share of the total energy budget in the United States. We are dependent on sources outside Michigan for 95 percent of our gas and oil, and all of our coal and uranium. We can't remain outside the overall energy cycle forever.

It is, however, premature to comment on specifics of ERDA's disposal plans, since no concrete proposal is now before us. We have many questions which cannot be answered prior to a full-scale final environmental impact statement. More questions are certain to surface during these and subsequent hearings. The nuclear technology is so esoteric that most citizens have difficulty even asking the right questions. Many unresolved problems of the nuclear industry have been disguised or minimized by powerful promotional interests. But we believe that the waste disposal problem is finally forcing ERDA, the nuclear industry, the utilities, and the public to face up to the complexity of the entire nuclear fuel cycle. We, the public, deserve a straight-forward candid approach from our federal employees at ERDA.

We must admit that we are skeptical whether ERDA can prove to the satisfaction of this state that disposal of nuclear wastes will be safe. This is the critical question. But we will reserve judgment until the facts are in.

The nuclear bureaucracy has often proved its allowances for human error to be less than adequate. The history of waste storage at Hanford, Washington, is dismal--

10 percent of the storage tanks developed leaks in only 20 years spilling 227,000 gallons of liquid. The same scientists who undoubtedly assured the public that these tanks were secure now want to assure us that safe storage for 200,000 years is technologically feasible.

Does ERDA propose a retrievable or irretrievable storage option for Michigan? If we retain the ability to retrieve wastes we build in some protection against error, unforeseen problems and disasters. But it comes at the unimaginable cost of full societal responsibility for perpetual monitoring by an eternal priesthood of radiation watchdogs.

An irretrievable storage system guards against an irresponsible or impermanent society, but at unpredictable environmental risk. It, too, will require perpetual surveillance to at least prevent drilling of holes into burial grounds.

The commitment we are about to make will require an unprecedented longevity of our social institutions. The philosophical and social implications are staggering.

We have a number of specific questions we hope will be addressed by ERDA for a full discussion by the public:

- 1) What is the nature, activity, and volume of wastes to be stored in Michigan?
- 2) What transportation will be used--rail, truck, or water carrier? What safeguards will protect the health, safety, and welfare of our citizens and the integrity of our environment from accident, sabotage, or human error?
- 3) What is the magnitude of the risk relative to contamination of water resources?
- 4) How does the future of our shakey reprocessing technology relate to storage plans?
- 5) Are the economics of reprocessing spent fuel rods dependent on refueling plants with plutonium--presently not legally permitted?

6) What are the implications of establishing a permanent storage facility, here or anywhere else, regarding a plutonium economy and breeder reactor program?

7) Do possibly undetected drill holes pose problems similar to the Lyons, Kansas site?

8) Will this site also be used for military waste burial? The Detroit Free Press has stated that only 8 percent of our current waste originates from commercial power reactors. Is this an accurate estimate?

9) Will this site be used for burial of wastes from foreign sources to which we have exported a reactor technology but not a reprocessing technology?

We trust answers to these questions--if in fact there are satisfactory answers--will surface during the next few months. We look forward to reviewing the hard facts and figures of this proposal in a comprehensive EIS. We trust the Governor's Nuclear Waste Disposal Task Force report, due on September 15, will narrow the unresolved issues.

One thing is certain. The people of Michigan will have to live with ERDA's decision for eternity. Those same people should have a strong voice in this decision. The federal government should therefore expect to fully adhere to Michigan's environmental review process. We believe the citizens of Michigan will agree with a decision to site a nuclear dump in our state if the proposal is fully aired and shown to be safe as supported by the evidence. We ask only for the opportunity to participate fully and responsibly in a decision which may forever affect the future of our state.

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STATEMENT OF THOMAS L. WASHINGTON, EXECUTIVE DIRECTOR,  
MICHIGAN UNITED CONSERVATION CLUBS

Mr. WASHINGTON. Thank you, Mr. Chairman and Mr. Ruppe. The Michigan United Conservation Clubs is a conglomerate of 400 affiliates located throughout Michigan of persons interested in conservation in all of its different phases.

We do not profess to be experts in this field. In fact, we are laymen. We are thankful for the opportunity to be able to appear before you and express our thoughts and concerns and to, hopefully, raise some questions before your panel that we believe must be answered before any activity can occur in Michigan in the field that we are addressing today.

MUCC has long prided itself on taking what we believe to be the responsible position in matters such as this and we hope our comments and remarks today will be also deemed responsible.

We have taken no position in the past concerning the development of nuclear energy; we have not opposed the construction of any of Michigan's existing nuclear power plants, nor the Midland plant scheduled to go on-line in 1981-82.

This does not imply, however, that we do not have a continuing concern about the future of the nuclear industry in our Nation and our State.

We are going to have increasing numbers of nuclear powerplants in the United States. The defeat of Proposition 15 in California, the so-called Nuclear Safeguards Initiative, is one more indication to us that the people have opted for continued reliance on an expanded nuclear technology to supply at least our near term energy needs.

Nuclear power, in our judgment, will provide a substantial portion, perhaps 40 percent of our future energy needs. It will also provide us with increasing amounts of high-level waste. Permanent storage facilities are essential for continued growth of the nuclear industry.

We expect this growth to occur no matter what we do here today.

I repeat, I don't want to have this appear as an endorsement of expanded nuclear use, although, but an inevitable thing in the immediate future.

Our testimony in behalf of our organization during the hearings on Project Independence was a testimony that saw an increased appropriation from the Congress for wind, geothermal, and solar research.

We don't see that coming but we are hopeful and we believe that ultimately that this will be the way this Nation and in fact the world will have to go.

MUCC does not oppose further studies to determine the feasibility of a nuclear waste disposal site in our State. Most of us wish the problem of radioactive wastes would just go away but of course it will not.

Michigan has a responsibility to carry our share of the total energy budget in the United States. We are dependent on sources outside Michigan for 95 percent of our gas and oil, and all of our coal and uranium. We can't remain outside the overall energy cycle forever.

It is, however, premature to comment on specifics of ERDA's disposal plans, since no concrete proposal is now before us.

We have many questions which cannot be answered prior to a full-scale environmental impact statement. More questions are certain to surface during these and subsequent hearings.

We must admit that we are skeptical whether ERDA can prove to the satisfaction of this State that disposal of nuclear wastes will be safe.

This is the critical question. But we will reserve judgment until all the facts are in.

The nuclear bureaucracy has often proved its allowances for human error to be less than adequate. The history of waste storage of Hanford, Wash., is dismal.

The same scientists who undoubtedly assured the public that these tanks were secure now want to assure us that safe storage for 200,000 years is technologically feasible.

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The commitment we are about to make will require an unprecedented longevity of our social institutions. The philosophical and social implications are staggering.

We have a number of specific questions we hope will be addressed by ERDA for a full discussion by the public:

One: What is the nature, activity, and volume of wastes to be stored in Michigan?

Two: What transportation will be used: rail, truck, or water carrier?

What safeguards will protect the health, safety and welfare of our citizens and the integrity of our environment from accident, sabotage, or human error?

Three: What is the magnitude of the risk relative to contamination of water resources?

I might emphasize that it has been said that Michigan has on its boundaries a third of the fresh water supply of the world.

I think this has to be a paramount concern to your deliberations, Mr. Chairman.

Four: How does the future of our shaky reprocessing technology relate to storage plans?

Five: Are the economics of reprocessing spent fuel rods dependent on refueling plants with plutonium—presently not legally permitted?

Six: What are the implications of establishing a permanent storage facility, here or anywhere else, regarding a plutonium economy and breeder reactor program.

Seven: Do possibly undetected drill holes pose problems similar to the Lyons, Kansas site?

Eight: Will this site also be used for military waste burial? The Detroit Free Press has stated that only 8 percent of our current waste originates from commercial power reactors. Is this an accurate estimate?

Nine: Will this site also be used for burial of wastes from foreign sources to which we have exported a reactor technology but not a reprocessing technology?

We I guess are saying will nuclear wastes be part of statesmanship in the future.

We trust answers to these questions, if in fact there are satisfactory answers—will surface during the next few months.

We look forward to reviewing the hard facts and figures of this proposal in a comprehensive EIS.

One thing is certain, the people of Michigan will have to live with ERDA's decision for eternity. Those same people should have a strong voice in this decision.

The Federal Government should therefore expect to fully adhere to Michigan's environmental review process. We believe the citizens of Michigan will agree with a decision to site a nuclear dump in our State if the proposal is fully aired and shown to be safe as supported by the evidence.

We ask only for the opportunity to participate fully and responsibly in a decision which may forever affect the future of our State.

I tried to keep it brief. I did a little editing while I sat in the back.

Mr. CARR. Well, I appreciate that and I appreciate your statement.

It is a very thoughtful one and raises a number of questions which we are anxious to have into the record and indeed a few, particularly the one about nuclear diplomacy that had not at once occurred to us.

Let me ask you, are you satisfied with—let me review for you a matter.

I don't think you were here. I noticed your entrance earlier this morning. You were not here when Dr. Taylor, the Governor's representative, gave us the Governor's input.

He talked about the task force that has been established and that Dr. Taylor has as a mechanism for providing, somehow or other, a State veto, whether that is exercised solely by the Governor or whether the legislature has input in that.

We don't know.

I have urged Dr. Taylor to communicate my concern with the Governor that the legislature also have some input. They are indeed elected officials like the Governor himself.

Are you, as an observer, a keen observer of the political situation here in Michigan? I know you have many friends and contacts among the legislature and agencies and the Governor's office.

Are you satisfied that the State has set up a viable, all-inclusive public input-type of decisionmaking process for the exercise of this veto, if indeed we can guarantee a veto power for the State of Michigan?

Mr. WASHINGTON. Well, yes, I think we have an excellent hearing process and a step-by-step procedure in which or rather through which individuals go in order to make themselves heard.

We have MUCC, at the MUCC, some political concerns about these questions and the veto question in particular. We have to divide it, and determine within ourselves whether or not this is a natural resource management question or whether it is a health and public safety question.

I think that if we operate under the assumption that the Governor or the legislature will be ultimately given the right of veto—and I am not taking a stand on that whether or not they should have the right—that there is a sufficient process in order to come up to the stage where the Governor would make that decision.

He is going to get a lot of input through public hearings I am sure, and from both our Michigan Environmental Review Board and the Natural Resources Commission and perhaps others in order to make his decision.

Mr. CARR. I yield to my colleague from northern Michigan.

Mr. RUPPE. Thank you very much. I appreciate your statement.

I think it is a very thoughtful one. I can't help but be taken by the several sentences in which you say Michigan has a responsibility to carry out its share of the total energy budget of the United States. We are dependent in this State on sources outside of Michigan for 93 percent of our gas, our oil, and of course all of our coal and uranium.

We cannot remain outside the overall energy cycle forever.

I think that is something for all of us to consider because I think there is a danger at times that we all become very negative on most any new type of energy development without realizing that we have to supplement existing sources of energy with new sources, with new techniques, but certainly on the whole with more energy than we have had in the past if we are to have a growing economy.

I am particularly interested in the range and scope of your specific questions and I intend to address ERDA for a response to those questions and perhaps if I may work with you and your organization to develop further these questions before we submit them to ERDA that would be well.

I think you have listed here a number of very important inquiries to be directed to that agency and if they are responded to in an appropriate way I think we can get many of the answers.

We in Michigan must have these answers before we go further in this area of nuclear waste disposal.

I thank you for that full range of questions that you have brought to our attention here this morning.

Mr. WASHINGTON. Thank you very much.

Mr. CARR. Thank you, Mr. Washington, for taking the time to come here and we are so indebted to your organization.

We hope to have future dialog with you.

Our next scheduled witness is Mr. Richard Campbell.

Mr. CARR. We welcome you to the subcommittee of the Interior and Insular Affairs full committee concerning itself with energy and environment. I might ask, do you have a prepared statement?

#### STATEMENT OF RICHARD CAMPBELL

Mr. CAMPBELL. No, I don't. I just have a written sheet here. I have one for myself. I didn't realize I had to submit it.

Mr. CARR. That is entirely all right. You may proceed. We would just kindly ask you to watch the time a little bit so that we can get to the other citizens who have been waiting and allow them an opportunity as well. I think we have until about 12:15 or 12:30.

You may proceed.

Mr. CAMPBELL. I am a citizen, I am not representing any group. I don't claim to be an authority on nuclear energy.

What I have done, I have researched the subject a little bit and I have learned quite a bit from it, and the paper that I have written here kind of tells a brief history of the pro's and con's and my feelings toward nuclear energy.

Modern man is in the age of rapid advance. The progress man is about to make within the next century must be studied and evaluated to gain knowledge for considerations of the effects to our world. Nuclear energy is one such advance that must be studied, and evaluated, and restudied, in terms of feasibility and safeguarding for the human pace.

Electricity was first generated from nuclear power in December 1951. This was 25 years after the discovery and the prospect of nuclear energy as a source of limitless amounts of safe, cheap, clean electrical power which has now become the subject of fears and debate with vast political, social, and scientific implications.

The question is this: Do the benefits of nuclear power outweigh the potential risks involved? Some say the nuclear power is needed for high, productive levels and to keep industrial nations industrious. Some fear that nuclear power is an omen to the planet because of the dangerous implications of the plutonium and dangers of radioactivity.

Let's evaluate the pro's and con's.

The pro's: In our capitalist United States, the pro's are more concerned with the economic outlook of nuclear energy, more so than the environmental aspects. They feel without the operation of nuclear energy there will be massive present-day energy shortages, such as in oil and coal, and there is the possibility of high unemployment, severe depression, and general apathy toward the Government, which could lead to national strikes and would include rioting and looting.

And there are economic comparisons of the amount of oil importing and the amount produced domestically. Environmentally, the pro's are in not such good shape. They will require advanced

safeguards to prevent extortion, and/or accidental happening, and they cannot guarantee 100-percent safe and economic results.

For the con's: For those who disagree with nuclear energy proposals, their claims number equally with the pro's. The nuclear people consider critics to be a thorn in the side because of the inadequate safeguard measures, the possibility of natural disaster and the chance of terrorism, and another large criticism is the amount of taxpayers' dollars needed to build, maintain, and have ample security precautions for each individual plant.

The dangers involved in nuclear waste are astronomical. For example, it is generally understood that plutonium, the major radioactive waste of nuclear reactors, is extremely toxic to living tissue. Dust particles smaller than the size of a pinpoint, if inhaled, are enough to generate lung cancer.

Thus, at some point in decades ahead there is the strong possibility that plutonium could find its way into the environment. Since plutonium is fissionable, it can be fashioned into weapons and the sabotage threat of plutonium diversion is impossible to stem. The life of human institutions, which must be safeguarded, also is an onerous question. Plutonium is dangerous for at least 24,000 years. This is the time needed for a given amount of material to lose only half of its radioactivity.

Since it has only been 10,000 years since the last ice age, it is safe to say that the demands for safety from plutonium radiation and terrorist activity is far beyond historically the human, political, and social systems.

There is also the predictability of fueling nuclear reactors. Conventional and fissionable fuels are finite and shortages are predicted within the century. The breeder reactors will produce more fuel than they can consume and burn of plutonium wastes, but the breeders will require more additional time than fossil fuel energy for development. If this is so, starting the country down an impossible energy route while bypassing other viable energy operations would be a most catastrophic of ironies.

The solutions to the problems of plutonium waste control and the raw materials needed in nuclear power production are perhaps within our grasp. However, before we begin construction on any more sites, we must have a strong hold on complications that may arise. Perhaps now would be the best time to utilize our intelligence in the space program to provide an area for dumpage of wastes; in other words, ship the wastes into outer space so we will remain free of natural disasters from plutonium's alarming capacities.

Nuclear energy is not our only alternative source of energy and we must not treat it like it is. The encouragement of other energy development must be made. The trend should be set to more safe methods of such things as solar and thermal energy use.

I will conclude by saying that I am against the advancement of nuclear energy, especially in Michigan's Upper Peninsula. I think this will lead us to a source of energy that could lead to devastation of our world.

There is too much risk of waste leakage sabotage and draining of our natural resources such as uranium. The odds may be set at billions to one to the threat of natural disasters, but who is to say when the odds will strike?

I have a few questions here that I would like to just kind of give to your committee to think about.

The nuclear energy plants, if given the go-ahead, will pop up all over the country no doubt. And they will be in areas where they will be feasible, I guess. Like I stated, your uranium supply is not real high and we are going to run out in 20-30 years if nuclear energy is in full production.

What will happen to these plants? They will be eyesores. I don't want to go on a vacation in Michigan's Upper Peninsula and look at a shutdown nuclear energy plant.

What will happen to the tourist industry in Michigan? Are the power companies going to provide the jobs that so many people depend on from the tourist industry?

How much money will the State of Michigan have to shell out for these nuclear energy projects?

Really, is there any question about nuclear energy with the dangers involved, with the high price, and just generally we don't know that much about it.

I am for the investigation and research of the projects, but I just feel that right now we are not ready for it because we don't know enough about it. And if, as I stated about the space program and the possibility of sending the canisters into outer space, I think if the canisters are dumped in the ocean or buried underground, what happens if an earthquake or something of this nature uproots these canisters and sends radioactive particles throughout our environment?

Thank you very much.

Mr. CARR. Thank you very much, Mr. Campbell. You obviously have given the topic a good deal of thought and study. Let me just ask you, pursuing your interest in the questions, political questions and economic questions of nuclear energy, have you been able to get all the information you desired? Have you felt that information was readily available to you?

Mr. CAMPBELL. Yes, it was. I received a paper from a professor at Michigan State University and I spoke periodically with him. I sort of researched it myself.

Mr. CARR. Part of the problem, of course, is that people often cite a lack of information, lack of access to information that they need to make crucial decisions on. It is more important for us know that you have had reasonably good access to information.

Mr. CAMPBELL. I feel I have. The facts—the dangers involved, of course, are pretty much factual, the dangers of plutonium.

Mr. CARR. Congressman Ruppe?

Mr. RUPPE. I have no questions, but I do want to thank you for a very good statement. We are glad to have you as a visitor up north. Come up often, bring your friends.

Mr. CAMPBELL. Thank you.

Mr. CARR. The next scheduled witness is Mr. James Grossfeld.

We want to welcome you to the Energy and Environment Subcommittee of the Committee on Interior and Insular Affairs, U.S. Congress.

#### STATEMENT OF JAMES GROSSFELD

Mr. GROSSFELD. Fine. Do you mind if I smoke?

Mr. CARR. If there is an ashtray there, sure.

Mr. GROSSFELD. Thank you.

Mr. CARR. You are far enough from me that I won't object. And if it meets with your approval, Mr. Grossfeld, and with unanimous consent we will introduce your statement as it has been prepared into the record and ask that you proceed in a manner you find convenient for the expression of your views.

Mr. GROSSFELD. OK. Well, I would like to read the statement I submitted earlier.

Mr. CARR. Fine.

Mr. GROSSFELD. When I began writing this, I had thought to make this another narrative concerning the safety of nuclear-waste-storage facilities such as that which is proposed for the Alpena area. Then it was brought to my attention, earlier today, that there is one question that is oftentimes not being asked concerning nuclear powerplants and the waste they produce. That question is: Do we really need nuclear power? It is well worth considering.

In the space of 2 or 3 years, the atomic energy industry, with the support of government, has been laying siege on the public, saying pretty much that it is nuclear power or else. It appears that they have managed to whip up quite a frenzy.

What I am wondering is what would happen if we did not develop nuclear energy? To listen to Union Carbide or Westinghouse, you would figure that the promise of fast-breeder reactors and huge plants is all that stands between us now and some sinister dark age of sorts lurking about out there in a nonnuclear future.

But, realistically, let us examine why nuclear power is being developed while cleaner and safer energy options exist in the form of solar, wind, and tidal energy, to name a few. The main difference between clean energy and dirty energy, such as nuclear power and fossil fuels, is that there is more potential for profit from developing the latter.

I think that it was Ralph Nader, who once said that we would have solar power heating our homes today if the utility companies could buy the lease to the Sun. Well, this seems to be what it has come down to. There are other differences, such as clean energy being safer and easier to decentralize, but to the power companies, which are in business to turn a profit, it is that potential for financial gain that is examined with the closest scrutiny.

The worst that could happen if nuclear power is not developed would seem to fall into these general areas:

One: By necessity, America would have to lower its rate of energy use, thus losing whatever illusory honor there is in being the most energy-wasting nation on the planet.

Two: By necessity, we would be forced into developing the cleaner, more easily decentralizable energy sources, which could lead to No. 3.

Three: Less dependence as people on the huge energy corporations, something which would evolve once people could supply their own energy part from large conglomerates.

Now, none of these options really look all that bad to me. It seems clear that nuclear power is unsafe, that the power companies don't really know what to do with the waste, and that development of nonpolluting, safe energy is within our grasp from a technological standpoint.

So, while there is the important question of whether or not to approve of the waste dump for Alpena, which the Nuclear Regulatory Commission already said it could support no matter what people here thought about it, there is also the even more important question of whether or not we really need nuclear power to begin with, whether the profits of utility companies are more important than the health of people and the stability of an already damaged ecology.

Why are we even building these powerplants if there is any question as to their safety?

Thank you.

Mr. CARR. Thank you for your statement. I yield to my colleague, Mr. Ruppe.

Mr. RUPPE. Well, I thank you very much. It is a good statement and you raise some very fine questions, very thoughtful ones. I question whether the companies are solely interested in nuclear power because power makes more money for them than does burning of coal or oil or burning of any other combustible material.

I think we do have great potential in solar, wind, and geothermal energy. I question whether that energy has been suppressed or I question whether it has not been pursued simply because it does not offer sufficient profit to those corporations involved in the use of that energy cycle because, frankly, I don't think that the United States has found a profitable or commercially viable method of using solar and wind power as yet.

On the other hand, neither have the European countries or the less advanced countries or the socialistic state countries.

Mr. GROSSFELD. Well, the thing about things like solar energy is that they are so easily decentralizable, and if you take that into account, you can have communities not dependent on centralized sources such as the fibers that hold the large populaces together which is the need to rely on one single source?

Mr. RUPPE. You are suggesting that solar and wind and geothermal would decentralize the power source?

Mr. GROSSFELD. It would increase the possibility of people to meet their own needs apart from large corporations.

Mr. CARR. It raises the question certainly when you talk about Project Independence, we probably ought to ask ourselves who shall be independent from whom?

Mr. GROSSFELD. Yes.

Mr. CARR. And we always talk about it in the context of the United States being independent from foreign sources. It might well be that we could discuss energy independence from the standpoint of the individual being independent from central sources of power.

Let me ask you: In your statement—let me quote from your statement. This is page 2:

So while there is the important question of whether or not to approve of the waste dump for Alpena, which the Nuclear Regulatory Commission already said it could support no matter what the people here thought about it, there is also \* \* \*

then you go on.

Mr. GROSSFELD. Yes.

Mr. CARR. I would like to nail down when did the Nuclear Regulatory Commission already say it "could support no matter what the people here thought \* \* \* ?

Mr. GROSSFELD. Two weeks ago or so there was an edition of the Michigan Sun, a paper out of Detroit.

Mr. CARR. The Michigan Sun?

Mr. GROSSFELD. Yes, it used to be the Ann Arbor Sun.

Mr. CARR. I see.

Mr. GROSSFELD. There was a statement concerning a rumor that people from Union Carbide Corp. already in the Alpena area, in DNR-controlled territory, drilled for these core samples and along those lines there was a statement that the Nuclear Regulatory Commission rather than Governor Milliken was disturbed when he heard that the NRC can go ahead with the project even over objections of the residents or State legislature.

Mr. CARR. It would help us to create a more complete record if you could obtain a copy of that article and submit it to us.

Mr. GROSSFELD. Sure.

Mr. CARR. We will make it a part of the files.

[The article will be placed in the committee files when received.]

Mr. CARR. I want to thank you again, Mr. Grossfeld, for taking the time to come to us with your point of view.

Mr. GROSSFELD. Thank you very much.

Mr. CARR. The next witness is Mr. Bob Repas, professor of labor and industrial relations, Michigan State University.

I want to note that I recognized you in the room at the very outset and explain to you that the reason why you are last is not due to any disrespect, but merely that we had made commitments to others who phoned in earlier for specific times and since you were not scheduled for a specific time, you would be the concluding witness and wrapping up our hearing.

It is a pleasure to have you here. Mr. Repas is an old friend from Michigan State University and it is a personal privilege for me to be able to talk with him across the congressional table.

I see you have a prepared statement and if it meets with your approval, I would like to ask unanimous consent that it be introduced into the record in total. I know that it includes some appended material which I also ask unanimous consent be put into the record of this hearing.

[The prepared statement of Mr. Repas follows:]

July 6, 1976

Congressman Carr, Congressman Ruppe

My name is Bob Repas. I am a Professor of Labor and Industrial Relations at Michigan State University. I wish to express my appreciation to both of you for taking a bi-partisan approach to one on the most important issues facing the citizens of this state, namely should Michigan be used as a garbage can for nuclear waste.

It is difficult if not impossible to discuss the subject of waste disposal without first examining the broader subject of whether nuclear development creates potential health and safety problems of a magnitude never contemplated at the time the atom was first split. I am a layman in this field and have no specialized knowledge in nuclear physics. However, as a result of being closely associated with one of the major unions in the mid 1950's which organized nuclear installations I was forced to make value judgments in respect to the hazards posed by them since union members would raise questions concerning these matters. It soon became clear that the government agency, the AEC, empowered to protect the citizenry, was involved in a long standing campaign of either concealing information, or else deliberately distorting the facts in respect to health and safety problems. Therefore, when members seriously raised the issue of protection from radiation hazards, my advice was to quit their job. In hindsight, I think this was the best advice available to be given at that time or today as well.

The dangers from radiation are so numerous that no fail safe mechanism exists.

Senator Clinton P. Anderson, hardly an opponent of nuclear energy, had this to say in a speech to the New Mexico AFL-CIO Convention in 1957:

It is no secret that I have been disappointed with the development of atomic power. I have had to take a position sharply in opposition to the position taken by the Administration and the Chairman of the Atomic Energy Commission.

Yes, I have found it necessary to urge labor unions to intervene against the action of the Atomic Energy Commission in granting a permit for the construction of the Lagoona Beach Reactor next to the City of Detroit. \* I felt that the AEC should have paid more attention to the warning of the reactor safeguards committee on the Lagoona reactor design. That committee, composed of eminent scientists, felt that the reactor was not ready for construction but that additional tests on parts of it should be made. The Atomic Energy Commission turned its back on that recommendation and proceeded to grant the permit. I telephoned not only the Governor of the State of Michigan, but I called labor unions and said to them that here was a reactor being built next to a great metropolitan area where workers in other factories would be subjected to the harmful radiation effects if there should be a breakdown in the Lagoona reactor. I felt that we should not permit the reactor to be constructed until we knew it to be safe. I carried that message to public officials and labor leaders.

The labor unions and the State of Michigan did intervene and long hearings have been conducted. Now that the hearings have been closed, I am delighted that the AFL-CIO has publicly announced that if further efforts are made to build the reactor, it also will intervene. I am pleased to find myself in such good company and supported by such strong allies, because I think that atomic power must be developed, but it must be developed without hazard to those who work in the plants where the power is being generated and also without hazard to the men, women and children who live in the surrounding areas.

Let me emphasize that it was the Michigan AFL-CIO that led the fight at this particular movement in history in respect to opposing unsafe plants. \*

The dangers posed by nuclear production are not restricted to the construction of this specific plant. I have appended to this statement a list of 271 accidents ranging in degrees of severity that occurred between the years 1945-1960. (See Appendix A) This list was compiled by Leo Goodman who at the time of its publication was Secretary, Atomic Energy Technical Committee IUD, AFL-CIO. He has since updated the list through 1966 and now believes that the total is in the neighborhood of 1500. *Accidents* \* 

Has the Atomic Energy Agency and its successor become a more reliable defender of the public interest in recent years. A New York Times headline dated 11/10/74 states, "AEC Files Show Effort to Conceal Safety Perils" The article goes on to say:

Atomic Energy Commission documents show that for at least the last 10 years the commission has repeatedly sought to suppress studies that found nuclear

reactors were more dangerous than officially acknowledged or raised questions about reactor safety devices.

....

In addition, the documents show that the commission ignored recommendations from its own scientists for further research on key safety questions. And they show that on at least two important questions the commission consulted with the industry it was supposed to be regulating before deciding not to publish a study critical of its safety procedures. (See Appendix B) — \*

....

The record demonstrates that this government watchdog has been turned into a housebroken puppy and cannot be relied upon to protect the public interest.

What then ought to be public policy in respect to the broader question of expanding nuclear facilities? There ought to be no further expansion until such time that a fail-safe method of waste disposal is developed. The dangers posed by waste disposal will continue to grow even if a nuclear plant can be built that will not be subject to radiation leaks in one form or another. The more plants we create, the more nuclear garbage we create.

Nuclear power is not the only alternative to fossile fuel power. This nation's eggs have been placed in the nuclear power basket for one reason--the death dealing destructive power of the atom. I suspect that if we developed a windmill that could produce a modicum of power as well as deliver a nuclear missile at the speed of sound, our obsession with nuclear power would rapidly erode. Even if a moratorium is declared on the construction of new plants we are still faced with the disposal of already accumulated waste. That disposal obviously ought not to take place near Alpena simply because salt mines are available. I urge our two Congressional representatives to examine the results of the AEC's efforts to dump waste in an experimental site near Lyons Kansas during the late 1950's. After an expenditure somewhere in the neighborhood of \$100 million the AEC's study was termed geologically unsuitable and the project abandoned Any dumping should be done as far away as possible from habitated areas.

I also urge our Congressmen to examine the record at the AEC Rocky Flats

installation in the State of Colorado. Here manmade earthquakes were produced by boring holes and pouring nuclear waste into the bowels of the earth which lubricated the rock strata and caused earth quakes. When the dumping stopped, the earth quakes stopped.

Certainly now is the time to begin extensive research in alternate sources of power: wind, water, solar and geo-thermal. Each step we take down the primrose path of nuclear development increases the potential hazards resulting from unsafe waste disposal. If the elected representatives are either unwilling or unable to face up to the military-industrial complex, than it may once more be necessary to engage in the direct confrontation tactics that were used during the Viet Nam war to bring the leaders of this nation back to their senses.

Bob Repas, Professor  
Labor and Industrial Relations  
Michigan State University

PARTIAL LIST OF ACCIDENTS INVOLVING RADIATION  
IN THE ATOMIC ENERGY INDUSTRY

<u>DATE</u>	<u>TYPE OF ACCIDENT</u>	<u>CITY</u>	<u>STATE</u>
1960 Dec. 2	Exposure to iridium capsule	Camden	N. J.
Oct. 17	Fused salt solution splashed on hands	Oak Ridge	Tenn.
Aug. 9	Zirconium fire in waste disposal	Boston	Mass.
Jul. 17	Release of tritium to atmosphere	Los Alamos	N. M.
Jul. 17	Co 60 sources lost in transit, Univ. of Colorado	Boulder	Colo.
Jul. 15	H <sup>2</sup> explosion in gas furnace	Oak Ridge	Tenn.
Jul. 6	Loss of radium and beryllium pellet in transit	Bet. Tex. and	N. M.
Jun. 2-6	Loss of contaminated water during shipment	Bet. Md. and	N. Y.
Apr. 26	Ce 144, Sr 89, Sr 90 exposures, ORNL	Oak Ridge	Tenn.
Apr. 26	Plutonium splinter pierced finger	Hanford	Wash.
Apr. 17	Uranium fuel fire	Hanford	Wash.
Apr. 10	Exposure during radiography to 120 rem	Pittsburgh	Pa.
Apr. 4	Loss of Sr 90 (7.5 mc), Guilfillan Lab.	Manchester	Mass.
Mar.	Unshielded klystron microwave tube exposure	Lockport	N. Y.
Mar. 26	Explosion at waste disposal storage site	Long Beach	Cal.
Mar. 14	Exposure during radiography	Portsmouth	N. H.
Mar. 10	Release of iodine 131 from defective fuel element	Vallecitos	Cal.
Mar. 8	Ce 144, Pr 144 burns during cleanup, ORNL	Oak Ridge	Tenn.
Jan.	Exposure during calibration of Co 60 source	Dayton	Ohio
Jan. 29	Exposure during radiography	Everett	Mass.
Jan. 15	Plutonium bottle ruptured	Los Alamos	N. M.

PREPARED BY:

Leo Goodman, Secretary  
Atomic Energy Technical Committee, IUD-AFL-CIO  
1126 Sixteenth Street, N. W., Washington 6, D. C.  
January 1, 1961

(more)

1959

Dec. 30	Radium burns, Naval Supply Center	Oakland	Cal.
Dec. 21	Sr 90 exposure dismantling apparatus in glove box	Jamaica	N. Y.
Dec. 19	JRR-1, release to containment	Tokai Mura	Japan
Dec. 18	Release of iodine 131 contaminating lab	Oak Ridge	Tenn.
Nov. 30	Exposures to Po 210	Miamisburg	Ohio
Nov. 20	Thorex Pilot Plant explosion, bldg. 3019, ORNL	Oak Ridge	Tenn.
Nov. 16	Plutonium explosion, bldg. 3019, ORNL	Oak Ridge	Tenn.
Nov. 11	Release of Ru 106 gas at X-10, ORNL	Oak Ridge	Tenn.
Nov. 1	Exposure during radiography, United Engineers	Philadelphia	Pa.
Oct. 30	Prototype explosion, Atomic Power Lab.	West Milton	N. Y.
Oct. 28	High level waste release to White Oak Creek	Oak Ridge	Tenn.
Oct. 16	Criticality accident exposed 21 persons	Arco	Idaho
Oct. 10	Sr 91 and Ba 139 release, Nat'l Reac. Test. Sta.	Arco	Idaho
Oct. 1	Removing hot sample holders from pool	Vallecitos	Cal.
Sep. 26	Cs 137 lost in truck accident	Robbinsdale	Minn.
Sep. 10	Loss of Ir 192 source, X-Ray Services	Fort Worth	Tex.
Aug. 21	Radioactive liquid vaporized to atmosphere	Aiken	S. C.
Aug. 10	Loss of contained source from truck	Quincy	Wash.
Aug. 6	Explosion of Po into room and corridor	Miamisburg	Ohio
Jul. 31	Exposure to Ir 192, Gen. Dynamics Corp.	Groton	Conn.
Jul. 29	Inhalation of S 35, RCA Labs.	Princeton	N. J.
Jul. 24	SRE reactor, fuel element failures	Santa Sus.	Cal.
Jul. 23	Loss of Kr 85 to atmosphere	Syracuse	N. Y.
Jul. 15	Filter fire released alpha emitters	Los Alamos	N. M.
Jul. 14	Package of isotopes crushed in transit	Detroit	Mich.

(more)

1959 Cont.

Jul. 3	High level spill at Lawrence Radia. Lab., bldg. 71	Berkeley	Cal.
Jul. 3	Exposure during synthesis of tracers, Tracerlab	Houston	Tex.
May 11	Employee exposed to H 3 gas, U. S. Radium Corp.	Bloomsburg	Pa.
May 5	Spill of iodine 131	Hempstead	N. Y.
Apr. 13	Exposure to x-ray and byproduct material	Newpt News	Va.
Mar. 31	Glove box explosion involving plutonium	Hanford	Wash.
Mar. 26	Exposures during radiography, Newport News Corp.	Newpt News	Va.
Mar. 23	\$5,000 fire in packaging area, Vanadium Corp.	Durango	Colo.
Mar. 20	Laboratory contaminated by tritium	Bartlesville	Okla.
Mar. 11	Exposure during radiography	Norfolk	Va.
Mar. 2	Molten uranium out of fractured mold	Albany	N. Y.
Feb. 9	Flask of C-14 shattered, Tracerlab, Inc.	Waltham	Mass.
Feb. 9	Exposure during radiography, Newport News Corp.	Newpt News	Va.
Feb. 4	C 14 boiled over	Shrewsbury	Mass.
Jan. 27	Glove box release of radioactivity	Aldermaston	Eng.
Jan. 6	Seven exposed at electron accelerator	Livermore	Cal.

1958

Dec. 30	Los Alamos criticality accident	Los Alamos	N. M.
Dec. 30	Exposure during radiography, Richardson X-Ray	Alhambra	Cal.
Dec. 8	Exposure during x-ray, Ingalls Shipbuilding Corp.	Pascagoula	Miss.
Dec. 4	Employee inhaled $3\frac{1}{2}$ times Po <sup>210</sup> limit	Miamisburg	Ohio
Dec. 3	Exposure during radiography, Arnold Greene Co.	Cambridge	Mass.
Dec. 1	Exposure to Ir 192 during radiography	Norfolk	Va.

(more)

1958 Cont.

Nov. 22	Overexposure of 80 workers, Nuclear Engineering	Charlton	Eng.
Nov. 21	Co 60 contamination of hot cell	Tonawanda	N. Y.
Nov. 18	Contamination in maintenance shop, Bldg. 3074, X-10	Oak Ridge	Tenn.
Nov. 18	Radiation in West Room, Bldg. 3005, LITR, X-10	Oak Ridge	Tenn.
Nov. 17	Exposure during radiography, Pittsburgh Test. Lab.	Pittsburgh	Pa.
Nov. 13	Personnel contamination in isotope area	Oak Ridge	Tenn.
Nov. 12	Fire at atom station, Chapel Cross Atomic Pow. Sta.	Dumfriesshire	Eng.
Nov. 12	Leak from Co 60 source	Bronx	N. Y.
Nov. 12	Release to air, New England Nuclear Corp.	Boston	Mass.
Nov. 11	Contamination at HRLAF, Bldg. 3019	Oak Ridge	Tenn.
Nov. 11	Radiation - 86" cyclotron, Bldg. 9201-2	Oak Ridge	Tenn.
Nov. 11	Air activity, Bldg. 3030	Oak Ridge	Tenn.
Nov. 7	Radiation-source, Bldg. 9207, Y-12	Oak Ridge	Tenn.
Nov. 6	Release of tritium to atmosphere	Boston	Mass.
Nov. 4	Contamination, Lab. A-B-25, Bldg. 4500	Oak Ridge	Tenn.
Nov. 1	Loss of Co 60, Industrial Welding & Testing Lab.	Houston	Tex.
Oct.	Thirty-six individuals exposed, Tech. Operations	Arlington	Mass.
Oct. 31	Contamination in Bldg. 4501	Oak Ridge	Tenn.
Oct. 30	Glass vial explosion, inhalation of Po 210, MIT Univ.	Cambridge	Mass.
Oct. 29	Bare-hand touching Ir 192, Tech. Operations, Inc.	Arlington	Mass.
Oct. 21	Exposures at reactor port, Battelle Memorial Inst.	Columbus	Ohio
Oct. 18	Personnel contamination at HRT (7500)	Oak Ridge	Tenn.
Oct. 15	Reactor power surge, Institute of Nuclear Sciences	Vinca	Yugo.
Oct. 14	Contamination on hand, Bldg. 3550, Room 2-A	Oak Ridge	Tenn.
Oct. 14	Pu contamination, Bldg. 3027, SF vault	Oak Ridge	Tenn.

(more)

1958 Cont.

Oct. 9	Contamination in Bldg. 4501	Oak Ridge	Tenn.
Oct. 6	Thorium spill, Bldg. 9204-1, Y-12	Oak Ridge	Tenn
Sep.	Sealed source exposed	Ithaca	N. Y.
Sep. 26	Thorium spill, Bldg. 9204-1, Y-12	Oak Ridge	Tenn
Sep. 22	Exposure during repair of radiographic source	Houston	Tex.
Sep. 20	Cralloy explosion	Los Alamos	N. M.
Sep. 20	Pu contamination, Bldg. 3505, X-10	Oak Ridge	Tenn.
Sep. 12	Street contamination, South side, Bldg. 4500	Oak Ridge	Tenn.
Sep. 11	Atmospheric radiation in "G" cell, Bldg. 3505, X-10	Oak Ridge	Tenn.
Sep. 10	Spill in Wing 4, Bldg. 4500	Oak Ridge	Tenn.
Sep. 9	Thorium oxide contamination, Bldg. 9204-1, Y-12	Oak Ridge	Tenn.
Sep. 8	Radiation in Bldg. 4500, Lab. A-29	Oak Ridge	Tenn.
Sep. 5	Two spills of P 32 in lab, Nuclear Consultants	St. Louis	Mo.
Sep. 5	Sr 90 - Y 90 incident, Bldg. 3038	Oak Ridge	Tenn.
Sep. 4	Contamination of Bldg. 4501, Reed Division	Oak Ridge	Tenn.
Aug.	Exposure to Ir 192 during radiography	Vallejo	Cal.
Aug. 29	Exposures during radiography, Univ. Tech. Test. Lab.	Haverton	Pa.
Aug. 29	Failure of high pressure loop, Bldg. 9204-1, Y-12	Oak Ridge	Tenn.
Aug. 28	Radiation in Bldg. 4505	Oak Ridge	Tenn.
Aug. 26	Spill of U 233, Bldg. 3550	Oak Ridge	Tenn.
Aug. 21	Alpha contamination, Bldg. 3019	Oak Ridge	Tenn.
Aug. 13	Spread of contamination in Bldg. 4501	Oak Ridge	Tenn.
Aug. 11	Exposure to Ra 226 foil, Admiral Corp.	Chicago	Ill.
Aug. 8	Contamination of first level, Bldg. 4501	Oak Ridge	Tenn.

(more)

~~160~~ Cont.

Aug. 8	Radiation incident in Bldg. 4500	Oak Ridge	Tenn.
Aug. 5	Exposures to Ir 192 in faulty camera	Portsmouth	N. H.
Jul. 28	Exposure during x-ray, Texas Pipe Bending Co.	Houston	Tex.
Jul. 25	Tritium gas release	Los Alamos	N. M.
Jul. 24	Exposure during leak test, AMF Co., Inc.	Brooklyn	N. Y.
Jul. 16	Contamination in Bldg. 3019	Oak Ridge	Tenn.
Jul. 14	Rupture of germanium target, Bldg. 9201-2, Y-12	Oak Ridge	Tenn.
Jul. 14	Exposure to Ir 192 during radiography	St. Louis	Mo.
Jul. 8	Contamination in Bldg. 3508	Oak Ridge	Tenn.
Jul. 7	Exposure during radiography, Indus. X-ray Eng.	Seattle	Wash.
Jun. 25	Exposure during radiography, Elec. Steel Foundry	Portland	Ore.
Jun. 25	Radiation in high level analytical facility	Oak Ridge	Tenn.
Jun. 23	Uranium fire	Attleboro	Mass.
Jun. 17	Th 230 contamination, Heavy Minerals Co.	Chattanooga	Tenn.
Jun. 16	Oak Ridge Y-12 criticality accident, ORNL	Oak Ridge	Tenn.
Jun. 16	Cs 137 exposure during radiography	Alameda	Cal.
Jun. 13	Radiation in cell 6, Bldg. 3019	Oak Ridge	Tenn.
May 28	HRT incident	Oak Ridge	Tenn.
May 26	Strontium 90 source fractured, U. S. Indus. Chem. Co.	Cincinnati	Ohio
May 25	Exposures, Advance Industrial X-Ray Labs.	South Gate	Cal.
May 23	Co 60 source lost, Fed. Civ. Def. Adm.	Thomasville	Ga.
May 23	200 A-Loop failure, Bldg. 9204-1, Y-12	Oak Ridge	Tenn.
May 23	Contamination in Bldg. C-1	Oak Ridge	Tenn.
May 23	NRU, fuel element fire	Chalk Riv.	Can.

(more)

1958 Cont.

May 10	Radiation incident in Bldg. 4500	Oak Ridge	Tenn.
May 3	Exposure to Sr 90 gauge, Goodyear Co.	Los Angeles	Cal.
Apr. 24	Exposure around x-ray machine	Camden	N. J.
Apr. 18	Burning crate of U 238	Sunnyside	N. Y.
Mar. 30	Exposure to Ir 192 during radiography	Seattle	Wash.
Mar. 21	Contamination in shipping, Bldg. 3038	Oak Ridge	Tenn.
Mar. 10	Exposures to Co 60 during radiography, Peerless Co.	Dallas	Tex.
Mar. 8	Employee exposed to 3.615 rem, Budd Co.	Philadelphia	Pa.
Feb. 28	Contamination in Bldg. 3019	Oak Ridge	Tenn.
Feb. 25	Radiation at 7500 (HRT)	Oak Ridge	Tenn.
Feb. 25	Contamination spread in Bldg. 3001	Oak Ridge	Tenn.
Feb. 12	Purex plant explosion	Hanford	Wash.
Feb. 10	Incident (sic) basement area, Bldg. 3019	Oak Ridge	Tenn.
Feb. 10	Exposure to Co 60 during radiography	Idaho Falls	Idaho
Feb. 5	Exposure to Co 60 during radiography	Alliance	Ohio
Feb. 4	Boiler-ventilator operator ingests 1/2 body burden	Rocky Flats	Colo.
Jan. 25	Sr 90 exposure during maintenance operations	Winston-Sal.	N. C.
Jan. 23	Fire in hot box	Harwell	Eng.
Jan. 17	Forty-nine construction workers exposed, Malan Co.	Oak Ridge	Tenn.
Jan. 10	Contamination in Bldg. 3550	Oak Ridge	Tenn.

(more)

1957

Dec. 26	Exposure to Ir 192 during radiography, Gen. Dynam.	Groton	Conn.
Dec. 19	Exposure to Ir 192 during radiography	St. Louis	Mo.
Dec. 18	Exposure to Ir 192 during radiography	Norfolk	Va.
Dec. 5	Release of Kr 85 gas, Gen. Dynamics Corp.	Fort Worth	Tex.
Nov.	Exposure to Sr 90 gauge, Goodyear Co.	Los Angeles	Cal.
Nov. 20	Cs 137 loss causes contamination, Gamma Ray Co.	Houston	Tex.
Nov. 1	Exposure during radiography, Ingersoll-Rand Co.	Phillipsburg	N. J.
Oct. 28	Exposure during radiography, Bethlehem Steel Co.	Quincy	Mass.
Oct. 14	Y-12 inhalation of air-borne uranium	Oak Ridge	Tenn.
Oct. 10	Windscale #1, burning fuel elements	Windscale	Eng.
Oct. 5	Entry into hot lab, ORNL	Oak Ridge	Tenn.
Oct. 2	Four employees overexposed, U. S. Radium Corp.	Bloomsburg	Pa.
Sep. 27	Unshielded sources in adjacent hood	Burbank	Cal.
Sep. 23	Sr 90 exposure, Isotope Products Inc.	Buffalo	N. Y.
Sep. 18	Exposure to Sr 90 - 8/16 through 9/18	Arlington	Mass.
Sep. 11	Plutonium fire	Rocky Flats	Colo.
Sep. 8	Exposure, Industrial Welding & Testing Lab.	Houston	Tex.
Sep. 4	Exposure to Co 60 during radiography, Dodge Steel	Philadelphia	Pa.
Aug. 26	Loss of Co 60 wire, Cal. Research Corp.	San Fran.	Cal.
Aug. 16	Repeated exposures, Technical Operations, Inc.	Arlington	Mass.
Aug. 16	Plutonium dust explosion	Los Alamos	N. M.
Aug. 15	Loss of Co 60, Halliburton Oil Well Chem. Co.	Houston	Tex.
Aug. 15	Employee overexposed, Industrial X-Ray Eng.	Seattle	Wash.
Aug. 4	Exposure, Industrial Welding & Testing Lab.	Houston	Tex.

(more)

## 1957 Cont.

Jul. 28	Exposure, Industrial Welding & Testing Lab.	Houston	Tex.
Jul. 20	Tritium gas discharged to atmosphere	Brooklyn	N. Y.
Jul. 11	Exposures, Advance Industrial X-Ray Labs.	South Gate	Cal.
Jul. 3	Sr 90 air contamination 100 times m. p. l.	Jamaica	N. Y.
Jun.	Sr sealed source lost, Robertshaw-Fulton Co.	Anaheim	Cal.
Jun. 28	Loss of unmarked capsule, Western Co.	Midland	Tex.
Jun. 27	Exposure to strontium 90, Univ. of California	Berkeley	Cal.
Jun. 24	Exposure during reactor experiment, Gen. Dynam.	Fort Worth	Tex.
Jun. 22	Exposure during radiography, HESCorp.	Hartford	Conn.
Jun. 17	Ingested iodine 131, Abbott Labs.	Oak Ridge	Tenn.
Jun. 17	Exposure during radiography, Budd Co.	Philadelphia	Pa.
Jun. 14	Considerable plutonium contamination	Rocky Flats	Colo.
Jun. 14	Plutonium drybox explosion	Rocky Flats	Colo.
Jun. 10	Leak of Cs 137, Industrial X-Ray Engineers	Seattle	Wash.
Jun. 7	Uranium dissolver explosion	Hanford	Wash.
Jun. 5	Cs 137 sealed source lost, Gen. Dynamics Corp.	Fort Worth	Tex.
May 20	Exposure to Ir 192 during machine repairs, Budd Co.	Philadelphia	Pa.
May 15	Gas corrosion, Brookhaven Nat'l. Lab.	Upton	N. Y.
Apr. 22	Exposure to plutonium	Hanford	Wash.
Apr. 18	Exposure during radiography, James H. Herron Co.	Cleveland	Ohio
Mar.	Operational difficulties, Metal Recovery Plant	Oak Ridge	Tenn.
Mar. 25	Tritium sources stolen, Abraham & Straus	Brooklyn	N. Y.
Mar. 13	Iridium 192 release, M. W. Kellogg Co.	Houston	Tex.
Feb.	Drybox explosion, release of U-233, LASL	Los Alamos	N. M.

(more)

1957 Cont.

Feb.	Exposure during radiography, HESCorp.	Hartford	Conn.
Feb. 12	"Godiva" explosion, LASL	Los Alamos	N. M.
Feb. 11	Repeated exposures, Technical Operations, Inc.	Arlington	Mass.
Jan. 9	Laboratory fire, New York University	New York	N. Y.
Jan.	W-10 slurry pump failure, Metal Recovery Plant	Oak Ridge	Tenn.
	Machine operator exposed to uranium in air	Oak Ridge	Tenn.

1956

Dec. 11	Radioactive slugs over embankment	Pleas. Val.	Ore.
Dec. 10	Cyclotron worker handled lithium	Pittsburgh	Pa.
Nov. 11	Paducah fire	Paducah	Ky.
Sep.	Exposure during radiography, HESCorp.	Hartford	Conn.
Sep. 22	Thorium explosion and fire, freight car	Detroit	Mich.
Sep. 21	Plutonium splashed on employee	Hanford	Wash.
Aug.	Exposure during radiography, HESCorp.	Hartford	Conn.
Aug. 19	Seawolf reactor, seven exposed to radiation	Groton	Conn.
Jul.	Truck accident and fire	Monterey	Tenn.
Jul. 23	MTR reactor, gamma exposures	Idaho Falls	Idaho
Jul. 9	Radioactive material exposed in transit	Monterey	Tenn.
Jul. 2	Thorium explosion, Sylvania Elec. Products Co.	Bayside	N. Y.
Jun. 23	Plutonium oxide release, Eniwetok Prov. Ground	Eniwetok (Marshall Is.)	
Jun. 18	Plutonium release into control room	Hanford	Wash.
Jun. 16	Operator inhaled radioactive gas	Savannah Riv.	S. C.
Jun. 16	Inhalation of radioactive gas	Aiken	S. C.
Jun. 14	Zirconium explosion at Y-12	Oak Ridge	Tenn.

(more)

<u>1956 Cont.</u>			
May 14	Exposure of radiographic source	Ft. Belvoir	Va.
Apr. 30	Beta radiation injury to employee, LASL	Los Alamos	N. M.
Apr. 20	Car transporting uranium immersed in river	Western	Mont.
Mar. 24	Carload of uranium scrap derailed and scattered	St. Joe	Idaho
Feb. 1	Criticality accident, bldg. 9213	Oak Ridge	Tenn.
Jan. 17	Plutonium on hands	Hanford	Wash.
Jan. 16	Lab ejects radioactive dust	Oak Ridge	Tenn.
Jan. 10	Loss of Co 60, Sam Tour and Co.	Darby	Conn.
<u>1955</u>			
Dec. 8	Exposure to Co 60	Melbourne	Aus.
Nov.	PR reactor, fire in reactor slug	Hanford	Wash.
Nov. 29	EBR-1 reactor, meltdown at Idaho Falls	Arco	Idaho
Oct. 26	Damage to UF <sub>6</sub> cylinder in truck accident	Bardstown	Ky.
Jul. 27	Radioactive particle in ear	Arco	Idaho
Jun. 11	Radioactive sodium fire	Schenectady	N. Y.
May 11	Handled irradiated metal, G. E. Co.	Hanford	Wash.
Apr.	Exposure during radiography, HESCorp.	Hartford	Conn.
Feb. 16	Plutonium inhalation	Hanford	Wash.
Jan. 10	Air contamination, Chemical Processing Plant	Idaho Falls	Idaho
<u>1954</u>			
Dec. 30	Spill of 1500 gallons UNH in truck accident	Hanford	Wash.
May 26	Critical assembly building 9213, ORNL	Oak Ridge	Tenn.
May 7	Plutonium pot explosion	Hanford	Wash.
(more)			

<u>1953</u>				
May	11	Radioactive aluminum handling	Hanford	Wash.
Feb.	5	Pressure surge in processing radioactive solutions	Hanford	Wash.
<u>1952</u>				
Dec.	12	NRX reactor, power surge	Chalk Riv.	Can.
Oct.	29	Fire in a truck load of uranium	(Near) Kansas City	Mo.
Jul.	9	Beta burns to hands, LASL	Los Alamos	N. M.
Jun.	13	Radium capsule tracked around	Lemont	Ill.
Jun.	2	Criticality accident, Argonne National Lab.	Lemont	Ill.
<u>1951</u>				
Dec.	4	Plutonium waste fire	Hanford	Wash.
Nov.	16	Criticality accident	Hanford	Wash.
Jul.		Release of radioactive waste to city sewer system	Ames	Iowa
<u>1950</u>				
Dec.	13	Explosion	Chalk Riv.	Can.
Jan.	17	Loss of 40.3 mg of radium, U. S. Naval Station	Treas. Is.	Cal.
<u>1949</u>				
Jun.	27	Uranium fire	Los Alamos	N. M.
<u>1948</u>				
Sep.	7	Beta burns to ankle, LASL	Los Alamos	N. M.
<u>1948-1947</u>		Sixteen workers received exposure over 15 rem	St. Louis	Mo.
<u>1946</u>				
May	21	Criticality accident, LASL	Los Alamos	N. M.
<u>1945</u>				
Aug.	21	Criticality accident, LASL	Los Alamos	N. M.
Jun.	4	Criticality accident, LASL	Los Alamos	N. M.

\* \* \* \*

Mr. CARR. I would invite you now to make your presentation.

**STATEMENT OF BOB REPAS, PROFESSOR OF LABOR AND INDUSTRIAL RELATIONS, MICHIGAN STATE UNIVERSITY**

Professor REPAS. Thank you, Mr. Chairman and Congressman Ruppe. I am Bob Repas, professor of labor and industrial relations at Michigan State University. However, I appear here as an individual today.

I wish to express my appreciation to both of you for taking a bipartisan approach to one of the most important issues facing the citizens of this State, namely, should Michigan be used as a garbage can for nuclear waste?

It is difficult, if not impossible, to discuss the subject of waste disposal without first examining the broader subject of whether nuclear development creates potential health and safety problems of a magnitude never contemplated at the time the atom was first split.

I am a layman in this field and have no specialized knowledge in nuclear physics. However, as a result of being closely associated with one of the major unions in the mid-1950's which organized nuclear installations, I was forced to make value judgments in respect to the hazards posed by them since union members would raise questions concerning these matters. It soon became clear that the Government agency, the AEC, empowered to protect the citizenry, was involved in a longstanding campaign of either concealing information or else deliberately distorting the facts in respect to health and safety problems. Therefore, when members seriously raised the issue of protection from radiation hazards, my advice was to quit their job.

In hindsight I think this was the best advice available to be given at that time or today as well. The dangers from radiation are so numerous that no fail-safe mechanism exists. Senator Clinton P. Anderson, hardly an opponent of nuclear energy, had this to say in a speech to the New Mexico AFL-CIO Convention in 1957:

It is no secret that I have been disappointed with the development of atomic power. I have had to take a position sharply in opposition to the position taken by the administration and the Chairman of the Atomic Energy Commission. Yes, I have found it necessary to urge labor unions to intervene against the action of the Atomic Energy Commission in granting a permit for the construction of the Lagoona Beach Reactor next to the city of Detroit. . . .

The quote continues in the text of my paper in which he talks about contacting the Michigan AFL-CIO and urging them to aid him in his campaign to prevent the construction of this reactor.

Let me emphasize that it was the Michigan AFL-CIO that led the fight at this particular movement in history in respect to opposing unsafe plants. I regret to say that there are no representatives of the labor movement here today to speak on what I consider to be one of the crucial issues facing not only union members, but the citizens of this State in general.

The dangers posed by nuclear production are not restricted to the construction of this specific plant. I have appended to this statement a list of 271 accidents ranging in degrees of severity that occurred between the years 1945-60.<sup>1</sup> This list was compiled by Leo Goodman, who at the time of its publication was secretary, Atomic Energy Technical Committee IUD, AFL-CIO. He has since updated the list through 1966 and now believes that the total is in the neighborhood of 1,500 accidents.

Incidentally Leo Goodman is now a private consultant in this area in Washington, D.C. and I would hope that the Congressmen here would get in touch with him, because I think he is one of the people who has been most active in the last 25 years looking at the dangers posed by nuclear development.

Has the Atomic Energy Agency and its successor become a more reliable defender of the public interest in recent years? A New York Times headline, dated November 10, 1974, states, "AEC Files Show Effort to Conceal Safety Perils". The article goes on to say:

Atomic Energy Commission documents show that for at least the last 10 years the Commission has repeatedly sought to suppress studies that found nuclear reactors were more dangerous than officially acknowledged or raised questions about reactor safety devices. \* \* \*

In addition, the documents show that the Commission ignored recommendations from its own scientists for further research on key safety questions. And they show that on at least two important questions the Commission consulted with the industry it was supposed to be regulating before deciding not to publish a study critical of its safety procedures.

The entire text of that article is appended to my statement.

The record demonstrates that this Government watchdog has been turned into a housebroken puppy and cannot be relied upon to protect the public interest.

What then ought to be public policy in respect to the broader question of expanding nuclear facilities? There ought to be no further expansion until such time that a fail-safe method of waste disposal is developed. The dangers posed by waste disposal will continue to grow even if a nuclear plant can be built that will not be subject to radiation leaks in one form or another. The more plants we create, the more nuclear garbage we create.

Nuclear power is not the only alternative to fossil fuel power. This Nation's eggs have been placed in the nuclear power basket for one reason—the death-dealing destructive power of the atom.

I suspect that if we developed a windmill that could produce a modicum of power as well as deliver a nuclear missile at the speed of sound, our obsession with nuclear power would rapidly erode. Even if a moratorium is declared on the construction of new plants, we are still faced with the disposal of already accumulated waste. That disposal obviously ought not to take place near Alpena simply because salt mines are available.

I urge our two congressional representatives to examine the results of the AEC's efforts to dump waste in an experimental site

<sup>1</sup> See p. 155.

near Lyons, Kans. during the late 1950's. After the expenditure of somewhere in the neighborhood of \$100 million the AEC's study was termed geologically unsuitable and the project abandoned. Any dumping should be done as far away as possible from inhabited areas.

I also urge our Congressmen to examine the record at the AEC Rocky Flats installation in the State of Colorado. Here manmade earthquakes were produced by boring holes and pouring nuclear waste into the bowels of the earth, which lubricated the rock strata and caused earthquakes. When the dumping stopped, the earthquakes stopped.

Certainly now is the time to begin extensive research in alternate sources of power: Wind, water, solar, and geothermal. Each step we take down the primrose path of nuclear development increases the potential hazards resulting from unsafe waste disposal. If the elected representatives are either unwilling or unable to face up to the military-industrial complex, then it may once more be necessary to engage in the direct confrontation tactics that were used during the Vietnam war to bring the leaders of this Nation back to their senses.

Thank you very much.

Mr. CARR. Thank you very much, Professor Repas.

Do you have any questions?

Mr. RUPPE. I have no questions, but I do thank you for the statement. It is a very good one.

Mr. CARR. Thank you very much.

Now, before we wrap up the morning session of the hearings, I want to ask if there is anybody in the room who wants to make a statement or make a presentation to the subcommittee, who may not have checked in at the door and asked for time.

Right now I have no requests for additional time from witnesses, but I want to make sure that there is no one in the room who wants to make a statement. But if there are people in the room who want to make an expression, they have this ample opportunity to do so.

Are there any?

Seeing none, I want to make one final statement in expression of gratitude to the faculty and students and administration at the Cooley Law School who are making his room and the facilities here available to our congressional committee to hold this hearing today.

I hope we have conducted ourselves with the kind of dignity that might allow us to be invited back sometime in the event we have future hearings here in Lansing.

Do you wish to make a final statement?

Mr. RUPPE. Mr. Chairman, I would simply like unanimous consent to insert in the record my correspondence with ERDA and the letter I received from CEQ.

Mr. CARR. Without objection so ordered.

[The documents referred to follow:]

May 27, 1976

Dr. Robert C. Seamans, Administrator  
Energy Research and Development Administration  
20 Massachusetts Avenue, N.W.  
Washington, D.C. 20545

Dear Dr. Seamans:

I was very surprised to receive a call from your Congressional Liaison staff informing my office that the Energy Research and Development Administration was considering a site in northeastern Lower Michigan in my District as a disposal area for nuclear waste materials.

My staff's description of the phone call indicated that, quite properly, you were informing my office of the start of negotiations with the State of Michigan on the matter.

However, I was later to learn that this was not the case, and, in fact, your agency has pursued discussions with the Michigan Department of Natural Resources (DNR) relative to locating the disposal site in Alpena, Montmorency, and Presque Isle counties at what appears to be a series of meetings dating from a much earlier time.

I am also informed that ERDA plans no public disclosure of its intentions at this time and that the local citizenry in the area and their governments have not been informed of ERDA's intentions for the disposal of nuclear wastes.

I am sure you understand, Dr. Seamans, that the location of a nuclear disposal site is a sensitive issue with many of our citizens. In my view, it is a subject that is best discussed, studied, and, if need be, debated in public. I strongly feel that one of the causes of public disillusionment with the Federal government is the failure of government agencies to involve the citizens they serve in major decisions affecting them until the last minute.

Your agency's discussions with Michigan DNR officials on the disposal of nuclear materials in Michigan is an unfortunate example of what occurs all too often in Federal decision-making: the people affected and their elected officials are the last to know what plans are being formulated by their governmental agencies.

In light of these facts and in view of your agency's intentions to begin drilling test samples next month, I hereby formally request that ERDA advise the affected communities and their elected officials as to the nature and the extent of ERDA's interest and that you commit your agency now to preparing a full environmental impact statement as required by the National Environmental Policy Act of 1969, and the procedures outlined under this Act have been fulfilled.

Finally, I would appreciate being fully and completely informed as events occur about ERDA's plans for this disposal site and, for that matter, any other action your agency may be contemplating affecting the other 24 Michigan counties I represent in Congress.

It may have been an oversight, but it is nonetheless disturbing that, while your discussions with the Michigan Department of Natural Resources have been underway for nearly three months on this question, I was not informed until yesterday morning that you were seriously considering these three counties as a disposal area.

Thank you for your consideration of these requests, and I look forward to your early reply.

With best regards,

Sincerely,

Philip E. Ruppe  
Member of Congress

PER:jsr



UNITED STATES  
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

JUN 22 1976

Honorable Philip E. Ruppe  
House of Representatives

Dear Mr. Ruppe:

This is in response to your letter of May 27, 1976, to Dr. Seamans, concerning the Energy Research and Development Administration's (ERDA) program to evaluate geologic formations in Michigan as a disposal area for disposal of commercial radioactive waste. You expressed a concern that we have held a series of meetings with representatives of the State of Michigan's Department of Natural Resources (DNR) without having first apprised the State's citizens and elected officials of our intention to do so. Further, you stated you were informed that ERDA does not plan a public disclosure of its intentions at this time.

I would like to note prior to a further elaboration in this letter that ERDA has not decided upon the location of any of its sites for the geologic isolation of wastes and we have every intention of publicly discussing our plans beyond the discussions which have been underway with the Congress, state, and regional groups. Further, we agree with your view that the subject will need to be discussed and studied in an open way. Last, we will be complying fully with the provisions of the National Environment Policy Act of 1969 in the execution of the program.

In attempting to meet our waste management responsibilities, we may occasionally fail to communicate in a timely way with all interested parties as was the case in Michigan. I apologize for not promptly and fully informing you of the national program and the preliminary nature of the study on the geologic formations in Michigan. I regret the inconvenience caused you by that oversight.

In the interest of clarifying this matter, I would like to briefly outline the scope of our proposed work in Michigan (and elsewhere); the procedures in force for informing the public and their officials of our geologic evaluation plans; and finally, our site selection and decision-making process, relating to the management of radioactive waste from the nuclear power industry.

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Commencing last November, representatives of our Oak Ridge Operations Office and their contractors (and consultants) met with officials of Michigan's Geologic Survey, a part of the DNR. Additional meetings were held with these and other DNR officials in March and May of this year. The purpose of the meetings was to request assistance from the DNR to conduct an in-depth study of various geologic formations in Michigan's lower peninsula. Specifically, we were interested in the State's vast storehouse of Michigan geologic information which, with the help of the State's geologists, would be used to determine the quality, thickness, and character of the salt beds and their specific location in the lower peninsula. But, geologic information available on certain areas in Alpena, Montmorency, and Presque Isle counties was relatively sparse. To supplement that information, our people proposed to drill core holes in sections of those counties. This type of drilling operation is a routine means used by geologists to determine the precise geology of an area. All of this information will be provided to the State whether or not we proceed with more detailed investigations in Michigan. At the May meeting, our Oak Ridge people told DNR about our plans to contract for such drilling operations. The bedded salt formations that underlie parts of Michigan's lower peninsula are part of the Salina Formation which extends eastward through Ohio, West Virginia, Pennsylvania, and New York. We propose to study the geology of those other states also.

Many other geologic formations in the U.S. are also to be investigated, including those shown on the enclosed diagrams. The areas to be studied will far exceed the eventual number of sites which will be concluded as potentially suitable for detailed site evaluation. Therefore, our proposed work in the Salina Formation is just starting, and the study area selected did not constitute a site selection process. It is part of a preliminary yet scientific effort to determine which areas in the country might be selected for more detailed study. The objective of our geologic survey work is to demonstrate the feasibility of multiple storage sites in various parts of the country so that it would not be necessary for one region to serve as the waste disposal site for the entire country.

In the future, I have arranged that besides fully and promptly informing the Governor's office of that work, there will be more timely discussion with the appropriate Congressional delegation of a state of our study plans and our interest in test drilling and testing in geological formations there. We do plan to increase state involvement if the program goes beyond the study phase. This already is the practice in another state, in which extensive geologic investigations are underway.

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There are statutory requirements and controls in effect to assure that the public and their elected officials are not presented with a fait accompli when it comes to selecting a site, or sites, for the permanent storage of commercial radioactive waste.

We will conform with all applicable statutes including the National Environmental Policy Act and Title IV of the Intergovernmental Cooperation Act of 1969 as implemented by the Office of Management and Budget (OMB) Circular A-95 (Revised) which requires that state and local governments be provided with information on projected Federal development to facilitate coordination with state, regional, and local plans and programs. No test drilling will be undertaken in Michigan until we have carefully assessed the environmental consequence of the drilling and complied with the cited OMB circular.

Within ERDA, the Administrator will make the decision on whether a given site, or sites, should be procured for the permanent waste disposal of commercial radioactive waste. Part of the decision making process will be the development of a draft Environmental Impact Statement (EIS) and, when circulated, comments on it will be invited from Federal, state, and local government agencies, as well as the public. A public hearing, or hearings, on that draft EIS will also be convened if deemed appropriate and in the public interest. The comments received will be carefully evaluated and considered in the decision process. A final EIS, with substantive comments attached, will then be issued and circulated. That final statement will be submitted to the OMB and the Joint Committee on Atomic Energy (JCAE) in support of the budgetary request that ERDA will make in support of the Administrator's site selection(s) decision. In the final analysis, therefore, Congress makes the decision on whether a given site should be obtained or utilized for the permanent disposal of commercial radioactive waste, by virtue of its allocation of funds or the conditions under which it authorizes those funds to be expended.

I wish to reemphasize that ERDA has neither identified nor proposed any state, or states, as disposal sites for radioactive waste from the nuclear power industry, and we have considerable work to do before making that decision. The disposal of radioactive waste is admittedly a sensitive and frequently misunderstood issue. ERDA realizes that if we are to achieve public acceptance of our program, the public and their elected officials must be encouraged to participate in its development. We are now in the early stage of our geologic evaluation program, and I intend to inform the public and appropriate officials

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of our interest in the geology of their state before commencing studies there. As we proceed with our geologic evaluations countrywide, extensive involvement of state geological and radiological personnel, as well as state and local environmental groups, is planned both to aid the program and to insure that officials and the public are kept well informed about the ERDA program. In addition, participating in Congressional hearings, issuing official press releases, accepting public speaking engagements, and answering Congressional and public inquiries, are examples of our continuing attempts at openness in discussing our waste management program with the public and their elected officials.

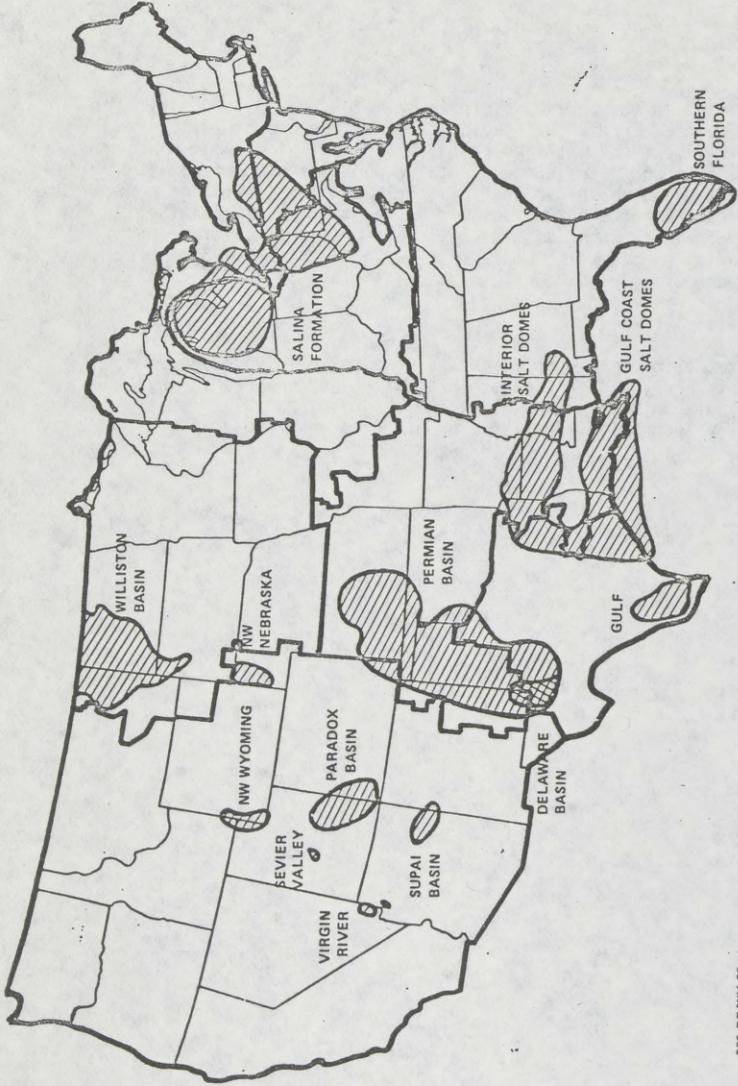
I hope that the information provided is responsive to your concerns. In the event that you need further information on our program and how it impinges on Michigan and the 11th Congressional District, I will be happy to provide you with a briefing on that subject.

Sincerely,

*F. P. Baranowski*

for Frank P. Baranowski, Director  
Division of Nuclear Fuel  
Cycle and Production  
353-4413 - Germantown  
376-4768 - Do Mass.

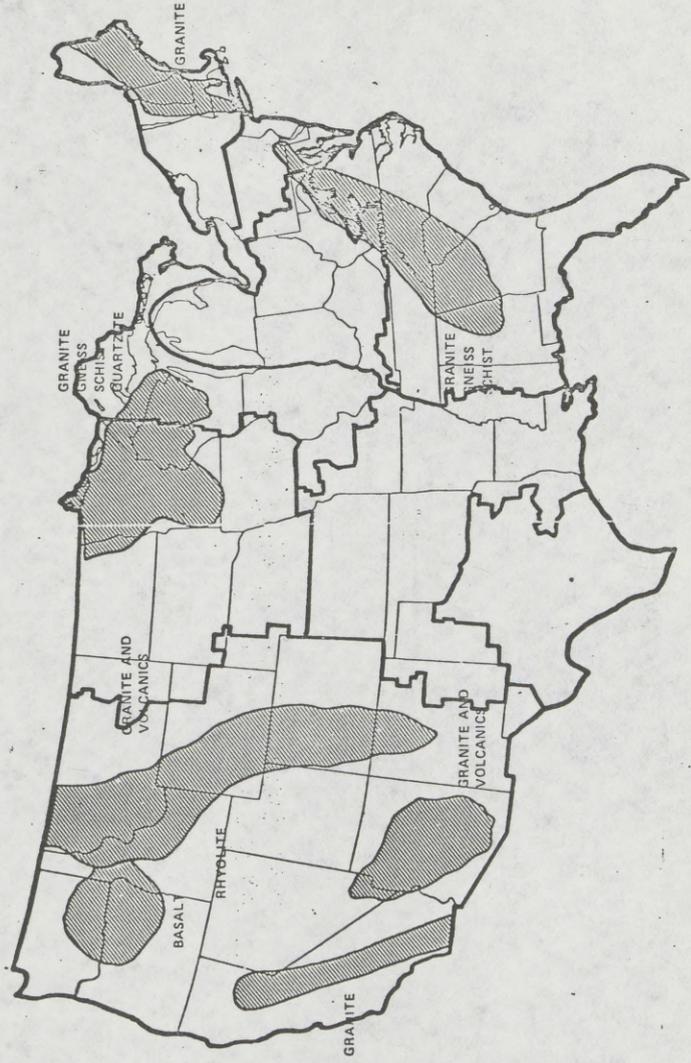
Enclosures:  
Geologic formation diagrams (3)



056-RR/WM-22

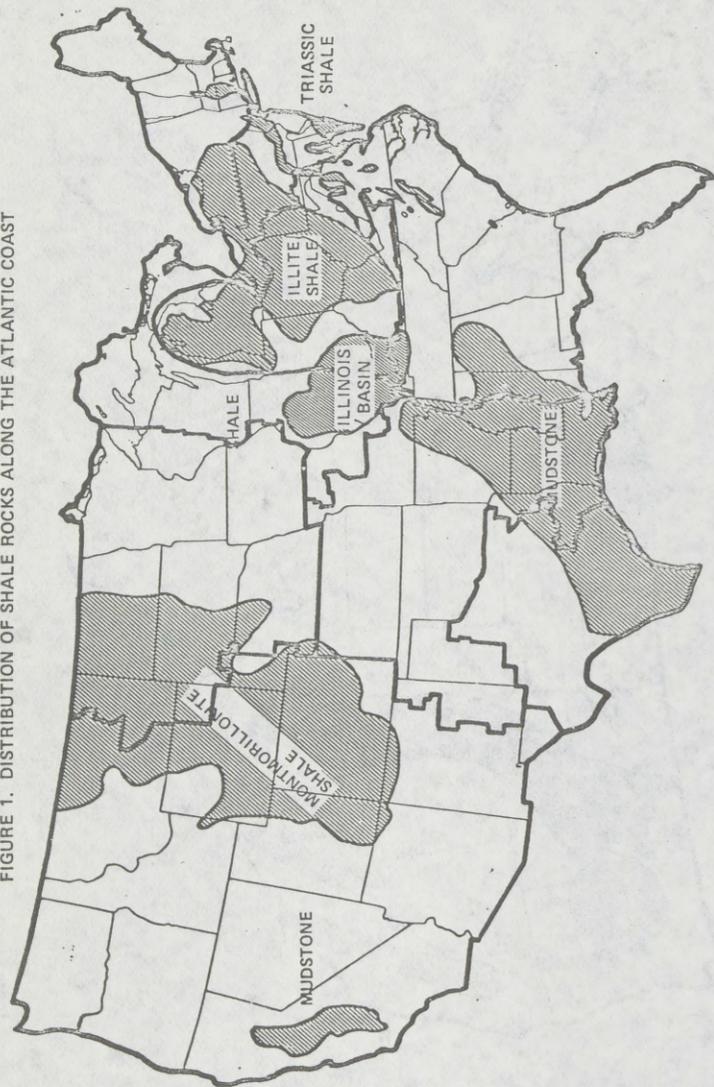
ROCK SALT DEPOSITS IN THE UNITED STATES  
(AFTER PIERCE AND RICH, U.S.G.S. BULL. 1148)

5804D REV. 6/75



CRYSTALLINE FORMATIONS IN UNITED STATES

FIGURE 1. DISTRIBUTION OF SHALE ROCKS ALONG THE ATLANTIC COAST



ARGILLACEOUS FORMATIONS IN UNITED STATES  
5804F Rev. 6/76  
056-RR/NH-22

Mr. CARR. I now declare this meeting of the Energy and the Environment Subcommittee recessed until 2:30 in Alpena, Mich.

[Whereupon, at 11:45 a.m. the hearing recessed, to reconvene at 2:30., this day, in Alpena, Mich.]

#### AFTER RECESS

[The subcommittee reconvened at 2:42 p.m. in the Alpena High school, Alpena Mich., Hon. Bob Carr presiding.]

Mr. CARR. I declare, this meeting open and reconvened.

It is a pleasure to be here today. I am Congressman Bob Carr from the sixth District of Michigan serving as Chairman of the Subcommittee on Energy and Environment of the full Interior Committee of the House of Representatives. We are holding hearings today on the matter of nuclear waste storage.

We convened first this morning in Lansing about 8:30, and took testimony from a number of witnesses including a representative of the Governor, Dr. William Taylor, head of the Governor's Task Force on Nuclear Waste Storage.

We also heard from Dr. William Rowe, head of the Office of Radiation Programs at the Environmental Protection Agency, from Washington.

We also heard from Thomas Washington, executive director of the Michigan United Conservation Clubs; from State Representatives Tom Anderson and Lynn Jondahl of East Lansing, and from a wide variety of citizens and other people concerned about the directions this Nation is taking with regard to nuclear energy, nuclear energy policy, and the specific topic of nuclear waste storage.

I might point out to those of you who are unfamiliar with our subcommittee that we have no legislation jurisdiction over nuclear matters. We only have oversight responsibility on nonmilitary nuclear policy. That leaves us somewhat handicapped to function as a legislative body in the U.S. Congress. Most of what we are is oversight and study and, hopefully, through our hearings and reports we issue, we can effectuate the policy of the U.S. Congress, but one of our dilemmas, too, is that we don't have all the tools and the authority and the power that we need to have a full role in the formation of the national nuclear policy.

I made an opening statement in Lansing. I am not going to repeat it here. It is going to be in the record. But let me summarize by saying that our major concern and the reason we are bringing these hearings to you today is our conviction that the people who are going to be most closely affected by the Nation's nuclear policy ought to have a voice in what happens.

The danger, of course, in any high state technology is that the technologically expertised element of our society is going to make decisions affecting all of us. And we are going to be subject to their decisions about our lives. Unless we are ready and willing and able and want to turn over the control of our democratic institutions to the nuclear elite of the country, we have an obligation to conduct such hearings and get the voices of citizens, people who are going to have to live next to nuclear installations; people who are going

to have to benefit from them; people who are going to have to pay the cost. And that is why we are here today. That is why we were in Lansing this morning, and this is, hopefully, the first of such hearings we will have while we chart our course as a Nation solving our energy problems and trying to design a beneficial nuclear policy.

I will now yield to your Congressman, a person I have been privileged to serve with on the Interior Committee. A person I have worked with very closely and I know his commitment to having the voices of the citizens of this district speak in the halls of Congress, not only on nuclear matters, but on a wide variety of other concerns.

It is my privilege to serve with him, and I believe he has a statement to make to you.

I yield to the Honorable Phil Ruppe, Congressman from the 11th District.

Mr. RUPPE. Thank you very much, Mr. Chairman.

I am very appreciative that you and this subcommittee staff would come to Alpena and hold these hearings today.

I might say that the hearings will give the people of Michigan, as they have this morning, an opportunity so far denied them by the U.S. Energy Research and Development Administration, and that is for the citizens themselves to hear the exact process and plans ERDA has for the disposal of nuclear waste and how these plans involve our State.

Today we will look at a small segment of the nuclear power debate in America. Where do we store the wastes which accrue from the production of electricity by nuclear energy? And what involvement should the people living next to a disposal site have in determining its location?

I, for one, will do everything I can as Northern Michigan's representative in Congress to assure that the people have a meaningful and significant input into the decisionmaking which surrounds nuclear waste disposal as it affects them.

I believe we are at a crossroads in deciding the future of nuclear generated electrical energy in our Nation. We will, in the next few years, have to reach a decision which will affect many generations yet unborn. However these decisions, I believe, will have to be reached by all of us. They cannot successfully be concluded by Congress alone, or by executive agencies alone or by State and local governments by themselves.

Equally important to the decision is how is it reached? To be a fruitful decision, it will have to be discussed openly and debated honestly. Frankly, I have not been impressed that ERDA has attempted to do this. My feeling was affirmed in the method used to look at Michigan as a potential nuclear waste disposal site.

Mr. Chairman, I have a more complete statement for the record, but in the interests of time I believe that we could dispense with it for now. Thank you.

Mr. CARR. We are ready for our first witness. I am pleased to introduce to you, Senator Bob Davis, a person I was privileged to work with in my days in Lansing in the State Legislature. It is good to see you again, Senator.

STATEMENT OF HON. ROBERT W. DAVIS, STATE SENATOR FROM  
THE STATE OF MICHIGAN

Senator DAVIS. Thank you, Mr. Chairman.

Mr. Chairman, and members of the committee, first of all, I am Senator Bob Davis, I represent the 37th Senatorial District which includes the Alpena County area.

Mr. Chairman, and members of the committee, I would like to thank you for the opportunity afforded me and others being affected by this proposal to speak our views.

These discussions concerning the disposal of radioactive wastes are, I think, a little misleading because these wastes are not actually disposable. They must be kept isolated from the environment and, therefore, "guardianship of nuclear waste" is a more accurate way to describe the task.

The United States has taken the irrevocable step of generating wastes now on the assumption that a solution to the disposal dilemma will be found in the future. It is unbelievably shortsighted and selfish that such a thing would happen in this day and age. Production carries with it a disposal responsibility.

Even now, millions of gallons of liquid waste and tons of solid waste are being stored in containers which will not last nearly long enough. There is no known material that will hold the waste until it becomes harmless, for some of the most deadly elements in it will retain their lethal potency for half a million years. A barrier more permanent than man can construct is what is needed in the long run.

Now, scientists are saying they are "certain" that within huge salt formations nuclear wastes may be held safely virtually forever, posing no threat to anyone or anything. They say salt resists corrosion and flows slowly when heated. At a certain distance from the heat source, flowing stops and the salt hardens again, sealing whatever space has been left open from the flowing. Because the salt is not exposed to water, which would, of course, dissolve it, there seems to be no threat to the container.

All of which may be well and true—theoretically.

There are simply too many "if's," "maybe's," and "almost's" and "assuredly's" to subject human beings to these possible perils.

As many as 20 years ago, scientists were voicing concern over nuclear waste disposal. On April 26, 1956, Dr. G. Hoyt Whipple, health physicist at the University of Rochester's Atomic Energy Project told a group of scientists, and I quote:

In the current wave of enthusiasm for nuclear power, the management of wastes has the position of a stepchild. One risks being branded a Cassandra if he points out, as I am doing, that waste problems may make or break the nuclear power business \* \* \* It may not be fashionable to ponder these problems, but it is nonetheless important to do so while there is still time to avoid serious mistakes.

That was some 20 years ago. It is now too late to avoid these serious mistakes? According to Science Magazine, 1 year ago there were 79 million gallons of liquid nuclear waste produced by nuclear weapons programs.

One very obvious hazard associated with making any place on earth a nuclear dumping ground would be the actual transporting of the high-level radioactive wastes. Have you forgotten already the ammonia truck that exploded a short time ago, releasing the toxic gases into the atmosphere? People were injured, and even killed then by something that is generally found in every household. What would the results be if a similar accident took place with these radioactive wastes, powerful beyond human comprehension?

However, the main worries are not the nausea and delayed hemorrhaging that characterize death by massive radiation poisoning; in the unlikely event of such an accident in handling or shipment, only a few persons would be affected.

Much more troubling is the mutagenic potential of small amounts of certain radioactive substances which may cause cancer if even the tiniest particle is inhaled. An inadequate storage or disposal method could allow it to find its way into the atmosphere.

The mile-square section 30 in Alpena County's Wilson Township which is being considered for the storage of high-level radioactive wastes is not uninhabited barren land. The proposed site is composed of marginal farmland, split up among four major property owners, the remaining operation—about one-half—is operated as a shale quarry for Alpena's Huron Cement Co.

Alpena County has a population of 32,000 and is growing. The tourist industry plays a major role in the area's economy. Would the tourists still come if the disposal sight were located here? Alpena is a major commerce and shopping center for a large area. The nearest rival with a population of more than 10,000 is Bay City—130 miles away. Would the people still come here to shop. Given a choice, people will probably stay away from the east side of the State.

The fact that talks pursuing the idea were held without even notifying local officials, let alone consulting them, is very frightening.

I believe it is crucial that States have the final say as to where, and if, nuclear wastes will be located within their borders; I do believe a Federal bureaucracy should have the power to impose such a decision on Michigan and its people. I have seen a newspaper account which indicated the U.S. Energy Research and Development Administration (ERDA) would not arbitrarily force the proposed atomic waste site on our people. But, as yet, there has been no official indication that the wishes of our people or our Governor would prevail in this matter.

The Governor should have veto power in such a sensitive and potentially dangerous situation. I have introduced in the Michigan Senate, Senate bill 1551 to give him that power. The ERDA has also said that before sites are definitely chosen, the public will have ample opportunity to comment on decisions through public hearings and other means—which, of course, is the reason we are here today.

But I ask, what good does it do to comment on decisions, when actually we should be participating directly in their making? When the idea of locating any kind of nuclear materials in somebody's backyard is considered by the Government it should go without saying the people in the area under consideration should be consulted first.

I have been in contact with Dr. Linus C. Pauling who was the winner of the Nobel Peace Prize in 1962 and the Nobel Prize for Chemistry in 1954. He told me flatly that there is no solution to the disposal of nuclear wastes.

Dr. Pauling who is a highly respected gentleman for his work in the nuclear field, said that once nuclear energy is developed to the stage of being practical for general use, it would run out after only 50 years. Another negative factor he pointed out, is that when people speak of the cheap nuclear energy source, they do not even take into account the huge costs of disposal. Nor are they calculating the cost to the earth to future generations.

He feels these huge sums of money now being used to look for disposal systems would be better expended on solar energy research. He says this is the best solution, and, of course, these are comments that I give to you from Dr. Pauling.

If there is a disposal system chosen, there will always be the problem of human error. We understand that. Site selection could be poor. Containment structures could be faulty. It is extraordinarily difficult to see ahead 250,000 years.

And that, perhaps, is the overriding issue in the nuclear waste controversy. We will be making decisions that we know could pose serious consequences for people in the future, people who can neither give us their views on the matter, nor reverse our decisions later on. Our awareness must be a little frightening.

As to the immediate problem: I believe the safety and the opinions of the people affected by this proposal must be paramount. I will fight for their right, and the right of the State of Michigan, to play the key role in this decision. I urge the members of this committee to defend our people and our State against the bureaucratic imposition of this program without the informed approval of those most directly affected.

I understand, Mr. Chairman, as you indicated at the start of the hearing, that your committee does not have specific power over ERDA, but I am certain that they would listen to their congressional delegation and I thank you very much for the opportunity to express my views.

Mr. CARR. Thank you, Senator, for your very fine and thoughtful statement. I would like to ask you a question about the veto power. Congressman Ruppe and I have been dealing with so-called State veto powers over Federal proposals in yet another area, Project Seararer and in doing so we have managed to guarantee a veto for our Governor over the Seafarer project. Although I have come to think we have to be concerned about how that veto is exercised and I posed a question Representatives Jondahl and Anderson earlier this morning, and I would like you to comment on it. Namely, shouldn't the legislature of the State of Michigan, being representatives of the people just like we are in Washington and the Governor is in the State House, shouldn't they also have a role in that veto power?

Up until now I have not heard of any proposal to include the legislature in that determination.

Does your legislation do that?

Senator DAVIS. Yes, thank you, Congressman Carr, I appreciate what you have done on Seafarer. Between Seafarer and disposal of, and Kincheloe Air Force Base we have our hands full in northern Michigan this year.

My bill does address itself to legislative approval. We do have a provision in there although it is not explicit whereby the legislature has input in the decision. I would not object and perhaps when we go back in September I will try to move my bill through the Senate and I anticipate no trouble, but I would guess that we may end up with a bill which would allow the legislature the same prerogative.

My only concern is that sometimes Congress, like the State legislature, we move extremely slow and in some cases we move very quickly. My only concern is in the Michigan Legislature as in Congress, sometimes it might be difficult to get action quickly when you want it and, therefore, we decided that the final decision ought to rest with the Governor who could in a very short period of time make a decision on behalf of the people of the State of Michigan.

I think I know the Governor's feelings in this particular matter, but I think that it may be good advice to consider the possibility of allowing the Michigan Legislature that same prerogative. I don't know how the details could be worked out, but before we pass that bill, I am sure we will.

Mr. CARR. I leave it to you, it is your jurisdiction and your bailiwick. I just see the shortcoming in terms of Seafarer, really, for example, the legislative arm has no formal role anyway, and I would urge on you as a State Senator and others who are vitally affected should have a role and I am sure the Governor is interested in getting your input, and would be agreeable to that kind of thing.

You mention Dr. Pauling. Did you have a letter from him, was this a verbal conversation?

Senator DAVIS. Dr. Pauling, as you know, is a verly highly respected nuclear physicist. I had one of my staff people talk with him at length on two separate occasions and I guess we could say briefly that the comments that I referred to here in my remarks sum up what he says.

He ended up by saying, "I wish you luck and hope that they will not establish that nuclear dumpingground in northern Michigan."

Mr. CARR. At this point, I will reserve my further questions and yield to my colleague, Congressman Ruppe.

Mr. RUPPE. Thank you very much, Mr. Chairman. I certainly appreciate your statement, Senator, and I realize very fully your concern in this matter and your interest in seeing to it that ERDA does not unilaterally pick northern Michigan as a disposal site.

Your legislation, as I understand it, would give to the Governor, but essentially to the State through the Governor, the right to veto the State of Michigan, as a site for any nuclear waste disposal, is that correct?

Senator DAVIS. Right.

Mr. RUPPE. And I would assume that the Governor would communicate with the legislature, with the DNC, and Environmental Assessment Board or possibly with the Public Service Commission be-

fore he would give this type of approval so that the approval would not rest solely with the Governor, but the agencies and legislative bodies available to him?

Senator DAVIS. Right, Congressman Ruppe, that is correct. When I introduced the bill, we were interested, not knowing how fast they would act or react in this case, to guarantee to the citizens of the State of Michigan some type of immediate veto power. We do have a provision in there whereby, I believe, and I would have to recheck this, the legislature would have, I believe the power to veto in effect what the Governors do. We would have the power to override him, whichever his decisions were.

That, perhaps, does give some balancing of power in that particular instance.

Mr. RUPPE. You indicated in your testimony that ERDA has advised the State of Michigan that before sites are definitely chosen, the public will have an opportunity to comment on decisions through public hearings and other means.

I gather you are somewhat dubious as to the quality, if you will, or to the importance attached to these hearings, and I believe you should be because ERDA definitely was going to go ahead with a drilling program as of last month, and certainly no public hearings have yet been held nor would they have been held regarding the drilling tests that would have been conducted in June had I not found out that they had not done an environmental assessment and were in violation of their own internal regulations. So, in effect, those who question at this time the sincerity of ERDA in holding public hearings and getting the assessment of their intentions from the public, I think, are very correct in questioning the results so far of that agency's decisionmaking.

Senator DAVIS. Well, Congressman, I am sure the people of northern Michigan are aware that if it had not been for you, my office or no one else would have found out that it was even being considered and we appreciate the fact that you have at least halted the drilling at this point.

Mr. RUPPE. I think the fact that you and others have legislation in the hopper will, I believe, encourage the State to demand the right of refusal for Michigan and certainly will give pause to ERDA in its, I believe, desire to select a site without hearings and without adequate consultation with the officials of our State.

Senator DAVIS. I think, you know, the whole sign of whether it is Federal or State or local government in the area of credibility leaves a lot to be desired and this is one of those areas where we have a—in this case, a Federal agency—doing things without, I think, proper consultation with the local people.

I think that is exactly what we are trying to get away from—not necessarily just on your level, we are probably guilty of the same thing at times, too. I think it is very important that the local people be allowed their say.

Thank you.

Mr. CARR. Senator, before you go, I wanted to reserve a couple questions.

Have you had any conversations with the Michigan Public Service Commission about the impact of nuclear waste storage on utility rates?

Senator DAVIS. I have not.

Mr. CARR. OK; you might want to pursue that. We are told by ERDA that it doesn't cost very much, but you don't get something for nothing and even drilling holes in the ground costs something, and it is going to reflect itself in higher utility rates which raises questions for some of us who have been questioning and cautious about this whole nuclear development in this country as to who is paying the real costs and who is getting the real benefit out of this head-long rush to a nuclear energy.

I just want to finalize one thing with you: Can I summarize your statement fairly by saying that you have some skepticism, some reservations about the confidence level we ought to have in the ERDA/NRC process to protect adequately the public health and safety?

Senator DAVIS. I think that is a fair statement, Congressman, and I think we could summarize my statement by saying, "I do not want, am not in favor of whatever the final results of your hearing or anyone else's hearing. I am not in favor of the disposal or deposit of nuclear wastes in this particular area."

Mr. CARR. Thank you again for taking the time to put together a fine statement and coming here today. We appreciate your being here and our report will benefit from your having been here.

Our next witness is State Representative Stevens, I believe.

#### **STATEMENT OF HON. E. DAN STEVENS, STATE REPRESENTATIVE**

Mr. STEVENS. Thank you, Mr. Chairman.

Mr. CARR. We are pleased to have you with us as well.

If it helps you in any way, with your approval and without objection of my colleague Mr. Ruppe, we will have your statement introduced into the record and you may proceed in any way that you find fit for the expression of your statement.

Mr. STEVENS. Thank you, Mr. Chairman, and Congressman Ruppe. My name is Dan Stevens, I am a representative in the Michigan Legislature, the 106th district which includes all of Montmorency, Presque Isle, and Cheboygan Counties, all of which have been under some consideration by ERDA for consideration as a dumping site.

Mr. CARR. Before you begin, I wonder if the people in the back of the room can hear?

VOICE. We can't hear.

Mr. CARR. If I touch that, it will self-destruct, I am sure. If you could suspend for a few moments so that everyone might hear your statement.

Mr. STEVENS. Thank you, Mr. Chairman.

I very much appreciate the opportunity to offer my views to your committee about the potential location of a terminal storage facility for commercial radioactive waste materials in northeastern Michigan. As a public official and as a resident, I must admit that my ini-

tial reaction on learning that the Alpena area was being considered as a site for this program was one of deep concern and flat opposition to the proposal.

This concern is not at all lessened on reading the files of several articles in preparation for this testimony. That was the statement by Frank Berynowski, Director of the Nuclear Fuel Cycle Division of ERDA before the Joint Committee on Atomic Energy on February 4, 1976. That included a chart 3 which purports to show the location of the rock salt deposits in the United States which might be suitable sites for permanent radioactive waste disposal.

The chart does not show any of these deposits in my three counties. I assume that chart 3 is inaccurate, but it did nothing to enhance the credibility of ERDA's chartmaker in my perspective.

I hope we are not going to bury this where there is not really any salt. I hope that the researchers and engineers have more competence. Be that as it may, the business of disposing of radioactive wastes appears essential to the long-term availability of inexpensive energy in our country.

Each of us who wants to flip a light switch and have the lights continue to go on has a stake in the disposal of nuclear waste materials. Consequently, none of us can ignore the responsibility of participation in the nuclear program nor can we in good conscience refuse to have our area considered, and I stress considered as a nuclear waste disposal site simply because the term conjures up all sorts of scary images.

Also, we in northeastern Michigan are desperately in need of new jobs and if, in fact, the final analysis indicates that a radioactive material disposal site was totally without danger, we would be foolish to oppose the economic benefits which it could undoubtedly provide. So while I am certainly not here to testify at this state in support of the proposed consideration of this act as a site for nuclear waste disposal, neither am I going to urge closing the door before we in northeastern Michigan have examined closely pros and cons of the issue.

My mind would become closed quickly, however, should any serious cons become apparent.

It seems to me that two factors must be agreed to at the onset before ERDA can be allowed to proceed with any testing or serious planning towards a northern Michigan site.

The first which we have alluded to, should be a firm agreement to the Governor of Michigan by ERDA that we in Michigan will have veto power over any final decision to locate such a site here. It is my understanding that such agreement, is being made so I won't elaborate further on that other than to say away from my statement for a second, that the current Governor of Michigan, has assured me that if he does achieve veto power that the local people will be heavily involved in his decision, that is the legislature and local units of government.

Unfortunately, as we look at the timetable for this, the final decision may not be in the making for another 6 or 8 years. So, conse-

quently, I think your question that you asked Senator Davis was a good one as to what assurances should be made that that decision will be based not solely on the decision of one man, but whole units of the legislature and, in fact, everybody affected ought to have a significant input into that decision.

The second factor deals with openness and availability of all relevant information to those of us who will be affected by the proposed dump site. I don't mean merely complying with the legal notice requirements by publication in the Congressional Record or whatever, and holding a public hearing in Denver, Colo.

I do mean extensive exchanges of all details to the residents of northern Michigan in accurate and effective manner. Obviously, the information is largely technical and I know that much information is yet to be gathered about this area's suitability as a site of the proposed testing program. However, it is crucial to my way of thinking that the whole process be open, honest, and with full disclosure of every aspect.

Toward that end, I am recommending to you today and to ERDA that out of ERDA's budget for nuclear disposals work an adequate sum be made to a combination of governmental units in northern Michigan for employment by them of a qualified nuclear consultant to help us evaluate the desirability of the proposed disposal program.

The material and information that we need is largely technical and I think we would feel much more confident if expert judgments could be made during site considerations by someone qualified and with allegiance to the people of this immediate area.

I know that the waste disposal budget has been increased this year some five times over last year, and I believe that the concept which I have just mentioned would be money well spent from both ERDA's perspective and most certainly from ours.

In closing, I wish to make two minor points in the record for the benefits of ERDA. Oil explorations at depths below the salt deposits is very likely throughout northern Michigan and must be considered by them in selection of any site obviously.

Also a nuclear waste site should not be located in an area that would preclude the future utilization of any resource that might be economically beneficial to this area.

I speak there specifically of shale mining and other mining that may take place and might be precluded by the location of a nuclear waste disposal site.

Finally, to my fellow citizens of northern Michigan, I urge that we keep our emotions in check and proceed with intellect in discussing and deciding this issue. The decision when properly made is of such a magnitude of importance to us that we cannot afford to dull the impact of our input at that time by prematurely crying "wolf".

Thank you, Mr. Chairman, Congressman Ruppe, for the opportunity of testifying here today. I would be happy to answer any questions that you may have.

Mr. CARR. Well, Representative Stevens, we are pleased that you came and gave us this fine statement. I am not going to go through

what I went through with Dr. Taylor, your colleagues, Jondahl and Anderson, and your Senate colleague, Senator Davis.

I would just like to underscore that if I am going to spend a lot of time with Congressman Ruppe fighting for the right of Michigan and its elected representatives to have a say in vetoing any such project that I want it to be made clear that the price of my support for that is that all of the elected representatives of the people have a voice. I trust and know and have a great deal of respect for our Governor, but as you aptly pointed out, this is a long-term thing that may span and undoubtedly will span, his term of office. We don't know who we are going to have in the Governor's office in future years, and there is just too much at stake to leave it up to one person or one person's staff or task force, or what have you. So, I am not going to extend our time here with a long dialog on that. I think I have made my point particularly clear and I appreciate your support.

I yield to my colleague from the 11th district.

Mr. RUPPE. Thank you very much.

Thank you, Dan, for a very good statement. I think you hit a very important note when you pointed out that we all need the benefits of nuclear power and the generation of energy by whatever source is available to us, and I suspect from time to time we all have to take part of the responsibility along with the privilege of enjoying that additional energy.

You really focused very sharply, I would gather from your statement, on the ability of the Governor to veto such a program in our State.

Mr. STEVENS. Still, Congressman Ruppe, I think it is essential that the Governor and really the people in this area that will be affected perhaps through the Governor have the opportunity to have the final say. I think it would be a tragedy if the site were brought here without consent by the people who will be directly affected.

As I think I pointed out in the statement, I, at this time, do not know whether it is a good thing or a bad thing, but I do hope to find out and make my decision and I hope that everybody in north-eastern Michigan will be given the information that will allow them to make an intelligent decision. But in the end, I think it is essential that they be in compliance with any decision that is made.

Mr. RUPPE. Certainly, as the State receives additional authority and responsibility in this area, the State will be able to use its own own experts whether they are the Governor's environmental assessment group or the DNR or the experts available to the legislature, as the authority of the State is enhanced in the decisionmaking process certainly the expertise available to the State and within the State can make a much more substantial contribution to the overall decision than they would otherwise. Simply, we would have the environmental assessment undertaken by ERDA and the final environmental impact statement, but I think that the people of Michigan, as you have indicated, would not be satisfied with that alone, but would want their own analyses and their own decisions in this regard to be made from within the State.

Mr. STEVENS. The point that I made in my testimony about having a local government expert is one that I would like to stress. It is true that if the State is given veto power that undoubtedly with the resources available to us in Lansing we would be able to employ and would employ some very good nuclear people to help us in this decisionmaking. The problem that I tried to mention, or the suggestion I have in my testimony would be solely for the benefit of the local units of government in northeastern Michigan who probably do not have available to them the resources necessary to employ on a continuing basis, to help them oversee this process, a qualified expert who would have allegiance to them.

The ERDA budget as I understand has gone up from \$12 million in terms of their nuclear waste programs last fiscal year, to \$60 million for the next fiscal year, I believe that it would be a good thing for this entire project, certainly from our perspective here in northern Michigan, but I would think also from every other perspective, to have some of that money made available to the local units of government to help them get involved in an expert way in the decision-making process.

I made that—I mentioned that in my testimony and I would urge this committee to consider making that recommendation to ERDA.

Mr. RUPPE. Thank you very much, Representative Stevens.

Mr. CARR. Before you leave, Representative Stevens, I want to pursue that consultant thing again.

I know that you put a lot of thought into that, but let me give you my perspective from the other end of the pipeline in Washington.

I don't think you really want a consultant that is paid by ERDA to do your bidding for you, your consulting here.

I am wondering if you make the proposal after having consulted with people at the great universities of this State that do have competence in this area, my own university, for example, Michigan State University, we have a nuclear—a whole group of nuclear physicists and it would seem to me that we shouldn't go to the ERDA budget to hire consultants for the local community until we first establish that we are without expertise and competence from our own community, perhaps elsewhere in the State.

Mr. STEVENS. Congressman Carr, I fully appreciate what you are saying and my proposal, if you would like me to detail it, would certainly not involve ERDA doing the hiring in this case. I also recognize having spent 9 years in Ann Arbor, very close to a nuclear reactor and having known a number of the people involved there, that we do have the expertise in the State of Michigan.

My proposal essentially would be to have ERDA grant the local units up here a sum of money with which they could hire on a continuing basis a consultant.

I would hope that it would be made in that direction. Now, perhaps the ERDA budget is not the place to look for that particular appropriation, but I think it would be a good idea for the Federal Government to provide those resources to northern Michigan to compete with their scientists in determining what is true information and what might be somewhat biased.

Mr. CARR. We thank you for your statement and your thoughtful concern and our report will certainly reflect that suggestion.

Mr. STEVENS. Thank you, Congressman, and I certainly do appreciate your bringing this committee to discuss this matter with us.

Mr. CARR. Our next witness is Mr. Carl Kuhlman, Assistant Director for Waste Management, Division of Nuclear Fuel Cycle and Production, U.S. Energy Research and Development Administration.

As I understand it, Mr. Kuhlman, there are some materials which you have brought with you which the people who are in attendance here are welcome to have so long as your supply lasts, is that not correct, and they will be available at the end of the meeting, I understand.

**STATEMENT OF DR. CARL W. KUHLMAN, ASSISTANT DIRECTOR FOR WASTE MANAGEMENT, DIVISION OF NUCLEAR FUEL CYCLE AND PRODUCTION, U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION; ACCOMPANIED BY CLAY ZERBE, MANAGER OF THE OFFICE OF WASTE ISOLATION, AND ALEXANDER PRICE**

Dr. KUHLMAN. That is correct, and if the supply doesn't last, a letter or a postcard will get additional material.

Mr. CARR. All right.

Your statement, Mr. Kuhlman, is lengthy and we want to hear it all and have a full dialog here. With your permission, I would like to ask unanimous consent that the entire statement with the accompanying charts and maps be included in the record.

Without objection, so ordered. You are free to proceed in any manner in which you feel comfortable.

[Statement and attachments follow:]

**STATEMENT OF DR. CARL W. KUHLMAN, ASSISTANT DIRECTOR FOR WASTE MANAGEMENT, DIVISION OF NUCLEAR FUEL CYCLE AND PRODUCTION, U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION**

Mr. Chairman and members of the committee: I am pleased to be here in the State of Michigan before this subcommittee to outline ERDA's proposed expanded program to seek within the United States safe, deep geologic storage sites for the terminal disposition of radioactive wastes from nuclear power reactors.

Before dealing with the ERDA program, I would like to say a few words about the source and nature of these wastes. When uranium or plutonium undergoes fission in a nuclear power reactor in addition to the energy, which ultimately becomes electricity, a variety of very highly radioactive elements are produced. These highly radioactive elements are called fission products. The accumulation of fission produced in power reactor fuel is the primary cause of refueling. Approximately one-fourth of the fuel elements in a power reactor are replaced each year. These so-called spent-fuel elements contain unused uranium, plutonium, and the fission products enclosed within the metal cladding of the fuel element. The normal fuel cycle provides for chemical treatment of the spent fuel in a reprocessing plant to separate the unused uranium and the plutonium formed in the reactor from waste fission products, or high-level waste is separated in the form of a highly radioactive solution containing essentially all of the fission products and only trace quantities of unseparated plutonium and uranium. The fission products produce heat and account for all

of the significant radioactivity. The fission products, which are most significant in the design of a waste repository, and one-half life of about 30 years, that is, half of the fission product decays within 30 years. The plutonium present in comparatively trace amounts has one-half life of 24,400 years. This trace plutonium has very little radioactivity, produces no significant heat but is a serious toxic material. Disposal of waste thus involves the placing of these wastes in a location effectively separated from the biosphere for what is by common standards a very long period of time. Large amounts of fission products and plutonium have been handled safely for years and processes to handle this material are constantly being improved.

The management of high-level waste requires first the conversion of this liquid waste into a stable, solid form and packaged for safe handling and transportation and finally emplacement in a repository. If for some reason, the spent fuel from the reactor is not reprocessed, the fuel elements, themselves, would be the material placed in the repository.

While the ERDA waste management program is directed at all aspects of the commercial radioactive waste problem, it is the terminal storage aspect of the program that is of concern to this hearing.

Emplacement of the waste in deep geological structures provides a terminal storage method which combines safety with a very minimum requirement for human surveillance. Furthermore, the construction and operation of such repositories is well within present state-of-the-art methods of geology, engineering, and construction. While the level of work has been modest, the AEC was investigating this geologic repository concept since the 1960's and considerable data have been accumulated. The expanded ERDA program of fiscal year 1977 builds on that base. The initial phases of the ERDA terminal storage program consists of a search for locations within geologic formations of known history of stability, free of circulating water, and which are not a major source of natural resources. Finally, these formations must be at appropriate depths for construction of a facility.

The general sequence of the development leading to the establishment of a facility can be separated into the following seven distinct steps: (1) Identification of formations of interest; (2) reconnaissance surveys; (3) in situ tests; (4) area studies; (5) detailed confirmation studies (6) Establishment of a Pilot Plant; and (7) conversion of the pilot plant into a Federal repository.

Although the steps are distinct, it is not necessary that they all be in sequence. In fact, the in situ testing could proceed in parallel with the area studies.

The question of particular interest here in Michigan is: Why is the Salina basin a part of ERDA's program? It is one of many rock salt formations within the United States as shown in one the first attachment to this testimony. Rock salt formations have been stable for hundreds of millions of years. They have been identified as suitable formations by such groups as the National Academy of Sciences. Rock salt is a favorable geologic formation because it is stable, it is plastic—that means cracks and openings are filled with salt in time—it can be readily mined and many formations are extensive and deep.

The Salina basin covers four States, including Michigan. Since the geologic data available on areas in Alpena, Montmorency, and Presque Isle Counties is sparse, further investigation is desirable. The preliminary drilling work was to be for this purpose and should not be interpreted as a decision by ERDA to select this region as a candidate area for the construction of a Federal waste repository. The drilling was to provide data on the Salina basin for use in review of potential areas for further study.

While I have been talking largely about salt formations because of the location of these hearings, there are other types of geologic formations which are part of the ERDA program. Besides salt, we are also interested in crystalline rock formations—granite, basalt, et cetera—and argillaceous formations—which include shales, mudstones, and others. Work is planned in all of these types of formations. Geographically, 45 of the States are associated with at least one of the extensive formations of interest.

The waste management program of the Federal Government is outlined in the statement of the Energy Resources Council—ERC—entitled "Management of Commercial Radioactive Nuclear Wastes—A Status Report," May 10, 1976. The Chairman of the ERC, Elliot Richardson, appeared before a Subcommittee of the Joint Committee on Atomic Energy on May 10, 1976, to discuss this report, which is the consolidated view of the Council on Environmental Quality, Department of Commerce, U.S. Geological Survey, Environmental Protection Agency, Federal Energy Administration, and ERDA. This document indicates that the construction of a pilot plant for receiving solidified waste in a geologic terminal storage facility by 1985 is a major ERDA task. The ERC report contains information about the roles of other agencies besides ERDA and also addresses other aspects of the waste management task besides terminal storage.

The ERDA plan for selection and investigation of study areas provide for extensive involvement with the concerned States. We plan to keep the localities informed. We have already directed ERDA's field offices and their contractors to maintain close liaison with State and local government. The evaluation of a number of study areas will lead to selection of a small number of potential pilot sites. The pilot plants will be excavated caverns of small size—about 1 percent of a full repository—at the depth of the full repository. Controlled experimental tests will be run during the pilot plant phase with radioactive materials. The pilot plants will be designed and operated such that these wastes can be removed easily if necessary. The pilot plants will include facilities costing in the range of \$100-\$200 million. The actual construction of the facility, as now scheduled, will not begin before 1981-82.

To obtain the authorization and appropriations from Congress for the project, ERDA is required to submit an environmental impact statement—EIS—under the provisions of the National Environmental Policy Act—NEPA—when we submit the authorization requests to Congress for the construction funds. The NEPA process requires public participation in the preparation of the final EIS. Thus, there will be a period of extensive investigation of many study areas with frequent opportunities for meaningful public participation before a selection will be made of the pilot plant sites. After a successful period of pilot plant operation, the site may then be expanded to receive waste materials for permanent storage on a routine basis. Our program is a phased approach with many opportunities for reviews between now and the time a repository is designated as a permanent site for the receipt of radioactive materials. We will need to obtain a license from the Nuclear Regulatory Commission for terminal storage of high-level radioactive waste under a special provision by Congress in the Energy Reorganization Act of 1974. The licensing process provides for a major critical review by the Nuclear Regulatory Commission with built-in opportunity for public participation.

We are now in the screening phase of the program with the expectations of selecting the first study areas within different rock formations. In addition to screening study areas in sufficiently understood formations, we will be conducting further reconnaissance surveys of the country for other candidate geologic formations. The number of these study areas will be progressively reduced until about five pilot plant sites are selected. Because of the variety of formations involved, these pilot plant sites will be selected over a period of time. Therefore, the initial areas selected for study may not necessarily be those selected for more intensive investigation prior to the selection of pilot plant sites. Some of the earliest contracts to be awarded will be to obtain data to assist ERDA in the selection of the final study areas within geologic formations. The large amount of basic investigative work to be done, even in the study area phase of the program, will contribute extensively to the geologic knowledge of the State.

The ERDA geologic evaluation program is being managed in the field by ERDA's Oak Ridge Operations Office through a contract with the Union Carbide Nuclear Corp. This contract is implemented by the Office of Waste Isolation, which reports directly to the president, Union Carbide Nuclear Corp., Oak Ridge, Tenn. Other contractors will be hired to do most of the study and

field work and this work will be coordinated by Oak Ridge. A chart showing the line of responsibility is attached to this testimony.

Although there is not sufficient time today to present the complete ERDA program, we will be reviewing this program in detail before a joint meeting of the Governor's task force on nuclear waste disposal and his Environmental Review Board in Lansing, Mich., on July 26, 1976. We will be discussing at that meeting the general ERDA program and our approach to selecting the study areas within the continental United States.

I believe it is important to recognize that ERDA has yet to receive funds for the expanded program which I am discussing. Consequently, the terminal storage program is in a very early stage. Serious efforts will begin October 1, 1976, when the expanded budget voted by both Houses of Congress on June 29 will become available. The administration budget submitted to Congress requested an increase in research and development efforts for terminal waste storage from \$4.6 million in fiscal year 1976 to about \$34 million in 1977. The ERDA budget approved by Congress contains \$5.6 million in budget outlay in addition to the administration request. It seems reasonable to conclude that this congressional budget action indicates support by Congress of the administration's program.

Earlier in my testimony, I referred to a need for site-specific environmental impact statement for the pilot plants. In the meantime, the drilling of holes for geologic data collection will be preceded by the preparation of environmental assessments. The environmental review process has already been started in a broad way. ERDA announced, on May 7, 1976, that it will issue in the spring of 1977 a draft, generic environmental statement on the management of post-fission radioactive wastes from nuclear power reactors. In preparation of the generic statement, ERDA has issued a 1,500-page technical document—abbreviated TAD—SRDA-76-43—which will be used to select the alternatives for indepth treatment in the generic environmental statement. The geologic alternatives is part of this document. A briefer summary of this document is available for easy access to the major findings of the larger document. Three TAD is being issued 1 year before the environmental statement to obtain comments of the general public. The TAD will be updated at the time the environmental statement is released in the spring of 1977. This document is not a decision document. Decisions as to particular waste management actions will be made by ERDA's technical review process with full recognition of the NEPA requirements. A Program Implementation Document was issued by ERDA on May 8, 1976, to summarize the waste management program for fiscal year 77 and to indicate the relationship of that program to the TAD.

Further, ERDA has scheduled during the week of July 11, an international symposium in Denver on radioactive waste. Much of the information in TAD will be summarized next week during that symposium. The first day of the symposium will be devoted to policy statements from key officials of various foreign governments and of the United States such as the Council on Environmental Quality, Environmental Protection Agency, Nuclear Regulatory Commission, Federal Energy Administration and ERDA. A subsequent public meeting dealing with other aspects (social, economic, and environmental, etc.) of radioactive waste management sponsored by the Council on Environmental Quality, the National Science Foundation and ERDA will be held in the fall.

In addition to our domestic program we are expanding our technical exchange programs with foreign countries to broaden the world base of information on geologic disposition of radioactive waste. Those involved in ERDA's domestic programs will participate in these international exchange programs. As an example of the international interest in radioactive waste management technology, one-third of the approximately 500 advanced registrations received to date for next week's international symposium are from foreign countries.

In the last part of my testimony, I would like to describe some specific steps we have already taken to increase the involvement of State agencies, Federal, and other organizations which will have a role in the eventual selection of permanent repositories for radioactive waste. The procedures are not complete, and they need to be tailored to the specific site and the State involved.

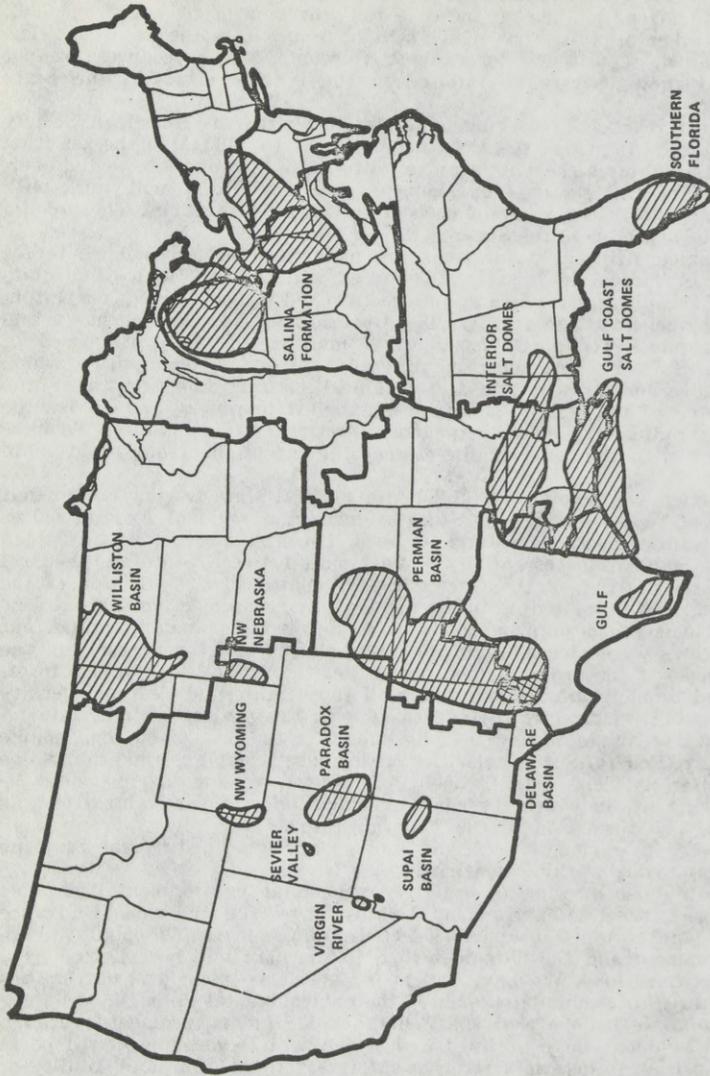
We have just reached a working understanding with the American Society of State Geologists in which the association will assist ERDA in the selection of study areas and later the pilot plant sites as well as contribute to the overall planning of ERDA's waste management program. ERDA will work with the State geologists in the study of each of the major formations. These deliberations will be available to the States.

In New Mexico, drilling explorations are underway for a possible site for isolating ERDA radioactive wastes. Like most States, New Mexico has quite a number of organizations which would be involved either directly or peripherally with a nuclear waste facility. The Governor of New Mexico has established a Governor's Technical Excellence Committee (GTEC), composed of leaders of the State's government, scientific and university communities, which advise the Governor on scientific and technical matters affecting the State. A subcommittee of the GTEC has been established to review and advise the Committee on radioactive waste management activities in the State. We have worked closely with that subcommittee since the inception of our program in New Mexico.

In New Mexico, we have also established a Federal-State Review Group that is comprised of representatives of State agencies and regional Federal offices which held its first meeting on June 10, 1976. The first meeting was attended by about 25 organizations essentially equally split between State and Federal agencies. Representatives of the Governor participated in the selection of the State organizations to be invited to the first review group meeting. This review group will hold meetings on a quarterly basis, and it is my understanding that the organizations were pleased that we initiated this effort very early in the evaluation phase of the program. The purpose of the group is to provide information to and promote interaction among all those State and Federal agencies whose responsibilities directly involve them with the project or indirectly require that they be aware of the possible impact of the project on their public activity. Many Federal-State activities today are complex and cannot be carried unilaterally. The establishment of such a review group would be offered to each State in which a serious investigation of a particular area was contemplated. The formation of the Federal-State agency review group is in no way expected to replace those individual groups identified by the State as requiring a day-to-day working relationship.

We plan to publish during the study area phase, an environmental plan for the areas so that baseline environmental data can be collected well in advance of the pilot plant project if one is selected for the area. The plan will be issued for comment and the data identified in the plan will be collected by a number of organizations. We have had good experience using the universities within the States to accumulate some of the environmental data.

In conclusion, we believe that the Federal and State governments, through the procedure which I have outlined and which will be developed, will be in the mutual position to determine from a safety standpoint the acceptability or nonacceptability of deep geologic sites for the terminal storage of radioactive wastes. We feel that the selection of geologic formations and sites within these formations must proceed on an accelerated basis. This selection must be supported by scientific evidence with reviews by independent groups to assure us that no fact is overlooked in the use of geologic sites for permanent disposition of radioactive waste.

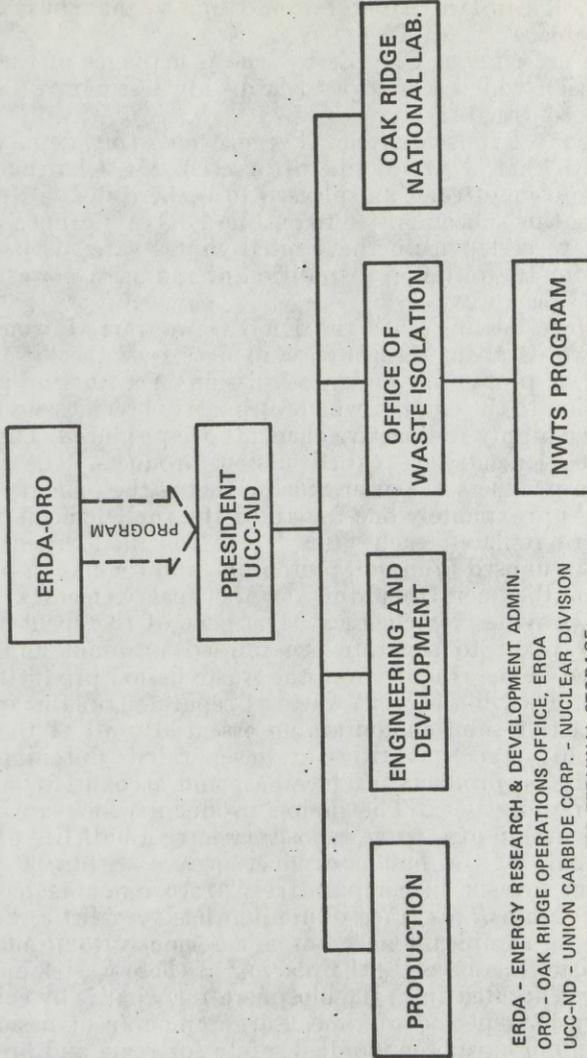


ROCK SALT DEPOSITS IN THE UNITED STATES  
(AFTER PIERCE AND RICH, U.S.G.S. BULL. 1148)

056-R/R/WM-22

5804D Rev. 6/76

# NWTS PROGRAM LINE OF RESPONSIBILITY



ERDA - ENERGY RESEARCH & DEVELOPMENT ADMIN.  
ORO - OAK RIDGE OPERATIONS OFFICE, ERDA  
UCC-ND - UNION CARBIDE CORP. - NUCLEAR DIVISION  
NWTS - NATIONAL WASTE TERMINAL STORAGE

Dr. KUHLMAN. First, I would like to introduce my colleagues at the table.

On my right is Clay Zerby who is manager of the Office of Waste Isolation which I will describe in my testimony. They are our primary contractor.

On my left is Mr. Alex Perge, who is my deputy.

With that, I would like to proceed. Mr. Chairman, and members of the committee, I am pleased to be here in the State of Michigan before this subcommittee to outline ERDA's proposed expanded program to seek within the United States safe, deep geologic storage sites for the terminal disposition of radioactive wastes from nuclear power reactors.

Before dealing with the ERDA program, I would like to say a few words about the source and nature of these wastes. When uranium or plutonium undergoes fission in a nuclear power reactor in addition to the energy, which ultimately becomes electricity, a variety of very highly radioactive elements are produced. These highly radioactive elements are called fission products. The accumulation of fission products in power reactor fuel is the primary cause of refueling. Approximately one-fourth of the fuel elements in a power reactor are replaced each year. These so-called "spent fuel" elements contain unused uranium, plutonium, and the fission products enclosed within the metal cladding of the fuel element. The normal fuel cycle provides for chemical treatment of the spent fuel in a reprocessing plant to separate the unused uranium and the plutonium formed in the reactor from the waste fission products or "high-level" waste. The "high-level" waste is separated in the form of a highly radioactive solution containing essentially all of the fission products and only trace quantities of unseparated plutonium and uranium. The fission products produce heat and account for all of the significant radioactivity. The fission products which are most significant in the design of a waste repository have a half life of about 30 years, that half of the fission product decays within 30 years. The plutonium present in comparatively trace amounts has a half life of 24,400 years. This trace plutonium has very little radioactivity, produces no significant heat but is a seriously toxic material. Disposal of waste thus involves the placing of these wastes in a location effectively separated from the biosphere for what is by common standards a very long period of time. Large amounts of fission products and plutonium have been handled safely for years and processes to handle this material are constantly being improved.

The management of high-level waste requires first the conversion of this liquid waste into a stable, solid form and packaged for safe handling and transportation and finally emplacement in a repository. If for some reason, the "spent fuel" from the reactor is not reprocessed, the fuel elements themselves would be the material placed in the repository.

While the ERDA waste management program is directed at all aspects of the commercial radioactive waste problem, it is the terminal storage aspect of the program that is of concern to this hearing.

Emplacement of the waste in deep geologic structures provides a terminal storage method which combines safety with a minimum requirement for human surveillance. Furthermore, the construction and operation of such repositories is well within present state-of-the-art methods of geology, engineering and construction. While the level of work has been modest, the AEC was investigating this geologic repository concepts since the 1960's and considerable data have been accumulated. The expanded ERDA program of fiscal year 1977 builds on that base. The initial phases of the ERDA terminal storage program consist of a search for locations within geologic formations of known history of stability, free of circulating water, and which are not a major source of natural resources. Finally, these formations must be at appropriate depths for construction of a facility.

The general sequence of the development leading to the establishment of a facility can be separated into the following seven distinct steps:

(1) Identification of formations of interest; (2) Reconnaissance surveys; (3) In situ tests; (4) Area studies; (5) Detailed confirmation studies; (6) Establishment of a pilot plant; and (7) Conversion of the pilot plant into a Federal repository.

Although the steps are distinct, it is not necessary that they all be in sequence. In fact, the in situ testing could proceed in parallel with the area studies.

The question of particular interest here in Michigan is: Why is the Salina Basin a part of ERDA's program? It is one of many rock salt formations within the United States as shown in an attachment to this testimony. Rock salt formations have been stable for hundreds of millions of years. They have been identified as suitable formations by such groups as the National Academy of Sciences. Rock salt is a favorable geologic formation because it is stable, it is plastic (that means, cracks and openings are filled with salt in time), it can be readily mined and many formations are extensive and deep.

The Salina Basin covers four States, including Michigan. Since the geologic data available on areas in Alpena, Montmorency, and Presque Isle Counties is sparse, further investigation is desirable. The preliminary drilling work was to be for this purpose and should not be interpreted as a decision by ERDA to select this region as a candidate area for the construction of a Federal waste repository. The drilling was to provide data on the Salina Basin for use in review of potential areas for further study.

While I have been talking largely about salt formation because of location of these hearings, there are other types of geologic formations which are part of the ERDA program. Besides salt we are also interested in crystalline rock formations (granite, basalt, et cetera), and argillaceous formations which include shales, mudstones, and others). Work is planned in all of these types of formations. Geographically, 45 of the States are associated with at least one of the extensive formations of interest.

The waste management program of the Federal Government is outlined in the statement of the Energy Resources Council (ERC) entitled "Management of Commercial Radioactive Nuclear Wastes—A Status Report"—May 10, 1976, The Chairman of the ERC, Elliot Richardson, appeared before a subcommittee of the Joint Committee on Atomic Energy on May 10, 1976, to discuss this report which is the consolidated view of the Council on Environmental Quality, Department of Commerce, U.S. Geological Survey, Environmental Protection Agency, Federal Energy Administration, and ERDA. This document indicates that the construction of a pilot plant for receiving solidified waste in a geologic terminal storage facility by 1985 is a major ERDA task. This ERC report contains information about the roles of other agencies besides ERDA and also addresses other aspects of the waste management task besides terminal storage.

At this point, Mr. Chairman, I would like to submit a copy of that report which is brief, for the record.

Mr. CARR. Without objection, so ordered.

[Report follows:]

# **Management of Commercial Radioactive Nuclear Wastes**

## **A Status Report**

Published by the Federal Energy Resources Council  
with participation by:

Council on Environmental Quality  
Department of Commerce  
Department of the Interior (U.S. Geological Survey)  
Environmental Protection Agency  
Energy Research and Development Administration  
Federal Energy Administration

May 10, 1976

## FOREWORD

The President's Energy Resources Council (ERC) has the responsibility for coordination of Administration policies and programs relating to energy. Because of the important role envisioned for nuclear power in the next decade and beyond, the ERC established a nuclear subcommittee to coordinate Federal nuclear policy and programs to assure that issues which arise are treated via an integrated Government effort.

This paper was prepared by those Federal agencies which are ERC members and have the technical, economic, and environmental expertise to provide a brief review of the nature of radioactive wastes and our ability to dispose of them safely.

ELLIOT L. RICHARDSON  
CHAIRMAN  
ENERGY RESOURCES COUNCIL

## THE MANAGEMENT OF COMMERCIAL RADIOACTIVE WASTES

I. SUMMARY

- ° Because of the national need to reduce dependence on insecure sources of imported oil, our limited ability to expand oil and gas production, use of domestic coal and nuclear power must increase substantially. FEA's 1976 National Energy Outlook indicates that nuclear power must expand from 9 percent of electric generation today to roughly 25 percent by 1985 to meet growing energy demands.
- ° Radioactive wastes are an inevitable by-product of nuclear energy production.
  - Radioactive wastes must be carefully processed, handled and isolated from the public until radioactivity decays to harmless levels. Thousands of years are required for radioactivity levels of some of these wastes to fall to levels of naturally occurring materials.
- ° It is scientifically and technologically feasible to manage these radioactive wastes in a safe manner. This is based on the knowhow and technology amassed through research, development and demonstration as documented in ERDA's comprehensive report titled, "Alternatives for Managing Wastes

from Reactors and Post-Fission Operations in the LWR Fuel Cycle." This document explains the technological options available to achieve multiple barrier isolation which includes three successive steps: (1) solidification of high-level nuclear wastes to a stable form, (2) the encapsulation of the solid, and (3) the storage of the containers in known stable underground geologic formations.

- The record in managing radioactive wastes over the last 30 years includes both favorable experience and instances where problems have occurred. While there have been no discernible health or safety effects on the public from these activities, the experience gained has benefited future planning, and should minimize problems when large-scale commercial operations begin.
- The Federal Government has accepted the responsibility for assuring the safe and environmentally sound management of nuclear wastes. This objective is being fulfilled through a recently accelerated, comprehensive government waste program plan calling for:
  - Extensive environmental assessments and impact statements, prior to decisions on reprocessing,

recycle, waste forms, storage modes, and packaging criteria.

- Selection of specific technologies for waste solidification.
  - Selection and qualification of waste terminal storage sites.
  - Demonstration and completion of technical development for commercial scale operations.
  - Completion of environmental, safety and related regulatory standards, criteria and reviews to assure acceptable radioactive waste management practices.
  - An interagency task force to coordinate these activities among the responsible federal agencies.
- ° The program is scheduled to satisfy the need for waste terminal storage facilities in a timely manner.
  - ° Radioactive waste volumes are small compared to other wastes produced by our society. Thus, even substantial costs that could be required for careful disposal of such wastes will not have substantial impact on the cost of electricity.

## II. CATEGORIES AND SOURCE OF RADIOACTIVE WASTES

- ° Nuclear power generation produces several types of wastes which can be classified as follows:

- (1) High-level radioactive wastes which must be delivered to Federal repositories for long-term management, and
  - (2) Low-level radioactive wastes which may be disposed of by near-surface land burial in commercial burial grounds.
- ° Fission products and those transuranic elements included in high-level wastes are by-products produced during nuclear power generation and remain contained in the spent nuclear fuel elements.
  - ° Spent fuel elements may be reprocessed to extract useable fuels. NRC is in the process (technical reviews, specific studies, environmental impact statements) of rendering a final decision on the permissibility of recycle of plutonium which is the principal transuranic element by-product from such reprocessing and which can be used as a fuel in nuclear reactors.
  - When fuel is reprocessed to separate wastes from useable fuels, most of the fission products and a small unrecoverable fraction of the useable fuel would be separated into a liquid high-level waste stream. If no reprocessing takes place, spent fuel elements themselves would constitute high-level waste

and could be put into terminal storage.

- Federal regulations require the conversion of high-level liquid wastes to a stable solid form and their delivery to a Federal repository for terminal storage.
- ° The second waste type includes low-level wastes such as contaminated materials having low levels of radioactivity usually not requiring much shielding nor extensive isolation measures.

III. TECHNOLOGY AND EXPERIENCE AVAILABLE FOR THE MANAGEMENT OF RADIOACTIVE WASTES

- ° The necessary base technology has been developed to meet future nuclear waste management requirements.
- ° The technical alternatives available to achieve each step of management including processing or non-processing of spent fuel are detailed in a comprehensive ERDA report titled, "Alternatives for Managing Wastes from Reactors and Post-Fission Operations in the LWR Fuel Cycle". For the management of high-level wastes produced from reprocessing, for example, the ERDA report indicates that:
  - Reprocessed commercial liquid waste can be solidified to a stable solid form such

as glass. This capability has already been demonstrated by pilot plant solidification of simulated waste.

- There are a variety of known stable types of geologic formations such as salt beds, salt domes, and granite, where solidified, containerized waste can be stored underground.
- o Technical feasibility analyses of underground multiple barrier storage systems indicate that high-level wastes can be isolated from the public in a manner that requires little surveillance.
- Multiple options for solid waste form, containers, and storage sites will continue to be pursued. This does not reflect uncertainties over the feasibility of technology, but is aimed at assuring development of acceptable waste management on a timely basis.
- Storage sites can be selected to minimize transportation requirements.
- o Radioactive waste volumes are small compared to other wastes produced by our society. Thus, even the substantial costs that could be required for careful disposal of such wastes will not have significant impact on the cost of electricity.

- ° Commercial low-level wastes, which are more voluminous than high-level wastes, can be safely disposed of through burial of solidified wastes in properly selected and controlled land burial sites. Current Federal efforts seek to improve site selection, management procedures, and regulation to assure safe disposal.
- ° The record in managing wastes over the past 30 years includes both favorable experience and instances where problems occurred. While there have been no discernible health or safety effects on the public from these activities, both the good experience and the problems have benefited future planning, and should minimize problems when large scale commercial operations begin.

#### IV. GOVERNMENT AGENCY RESPONSIBILITIES

- ° Several agencies of the Federal government have responsibilities for waste management as follows:
  - The Energy Research and Development Administration is responsible for development of environmentally safe waste management technology and for establishing and managing Federal radioactive waste repositories.

- The Nuclear Regulatory Commission establishes safety and environmental standards and criteria, and the licensing and inspection of handling, processing and storage facilities.
- The U.S. Geological Survey advises on and assists in providing the needed geologic and hydrologic data for waste storage sites.
- The Environmental Protection Agency establishes general environmental standards which must be met in connection with waste activities.
- States, pursuant to agreements with NRC, have surveillance over low-level waste disposal and storage facilities.

V. WASTE MANAGEMENT PROGRAM IMPLEMENTATION

- o Selection and implementation of the most appropriate of the existing and improved technologies will require:
  - The thorough reviews mandated by the National Environmental Policy Act.
  - The promulgation and satisfactory compliance with generally applicable

environmental standards and criteria issued by the Environmental Protection Agency.

- Compliance with licensing criteria and requirements of the Nuclear Regulatory Commission.

- Opportunities for full public participation.

° A Federal interagency task force was established to assure coordination of these activities which are being carried out by responsible Federal agencies.

° The commitment to provide adequate resources to achieve these high-level and related commercial waste management program objectives has been made by the Administration.

- Proposed funding of ERDA's commercial radioactive waste program is being more than quadrupled to \$60,000,000 in fiscal year 1977 to:

-- Expand the program for selection of several Federal repository sites.

-- Accelerate work toward a commercial basis of technology for the solidification of wastes.

- Accelerate work on final disposition of spent fuel from nuclear reactors, or containerized solidified waste in geologic formations.
- ° The timetable for major events in the management of commercial radioactive wastes including actions already taken:

1976

- ERDA announced an expanded program to develop Federal repositories in deep geologic formations for terminal storage of radioactive waste.
- ERDA identified candidate high-level waste solid forms for terminal storage.
- President's FY '77 Budget requested, and the Joint Committee on Atomic Energy has approved, funds to accelerate programs for:
  - selection of sites and construction of storage facilities, and
  - development of selected commercial scale solidification process technology and process designs

- ERDA established a terminal storage facility program management office at Oak Ridge, Tennessee.
- ERDA has issued for public review the Technical Alternatives Document.
- NRC will circulate preliminary revised waste form and packaging regulations for comment.
- EPA/NRC, with the assistance of USGS, will evaluate commercial low-level waste land burial sites and will determine criteria on radioactivity levels for wastes to be delivered to each site.
- ERDA will issue a draft generic environmental impact statement on reprocessing.

1977

- ERDA will issue a draft generic environmental impact statement on the management of commercial radioactive wastes for public review and comments.
- EPA will determine general performance criteria for establishment of new low-level waste land burial sites.

- NRC will publish an environmental impact statement for revised waste management regulation.
- ERDA will publish a final environmental impact statement on reprocessing and announce a decision thereon.
- NRC will announce its decision on plutonium recycle.
- ERDA will publish a final generic environmental impact statement on management of commercial radioactive wastes.

1978

- NRC will publish final regulations for waste form and packaging criteria.
- ERDA will announce a decision on waste forms, storage modes, and packaging criteria to be used as basis for designing terminal storage facility.
- EPA will establish general environmental standards applicable to high-level waste management.
- ERDA will select site(s) for the underground excavation phase of the radioactive

waste geologic program. (This action will be subject to the appropriate site-specific environmental impact statement.)

- NRC will establish criteria for long-term care for new low-level waste burial sites.

1979

- NRC will establish site selection criteria for new low-level burial grounds.

1985

- ERDA will start receiving solidified waste in pilot plant operations in a geologic terminal storage facility.
- ° The dates shown for major regulatory actions are estimates provided by the NRC. The NRC, an independent regulatory agency, points out that these dates cannot be predicted with certainty. Based on experience with regulatory process lead time, however, the time allowed in the program should prove sufficient to allow for full decision-making processes, including public participation.

Dr. KUHLMAN. The ERDA plan for selection and investigation of the areas provide for extensive involvement with the concerned States. We plan to keep the localities informed. We have already directed ERDA's field offices and their contractors to maintain close liaison with State and local groups once appropriate arrangements have been made with the State government. The evaluation of a number of study areas will lead to selection of a small number of potential pilot plant sites. The pilot plants will be excavated caverns of small size—about 1 percent of a full repository—at the depth of the full repository. Controlled experimental tests will be run during the pilot plant phase with radioactive materials. The pilot plants will be designed and operated such that these wastes can be removed easily if necessary. The pilot plants will include facilities costing in the range of \$100 to \$200 million. The actual construction of the facility, as now scheduled, will not begin before 1981-82.

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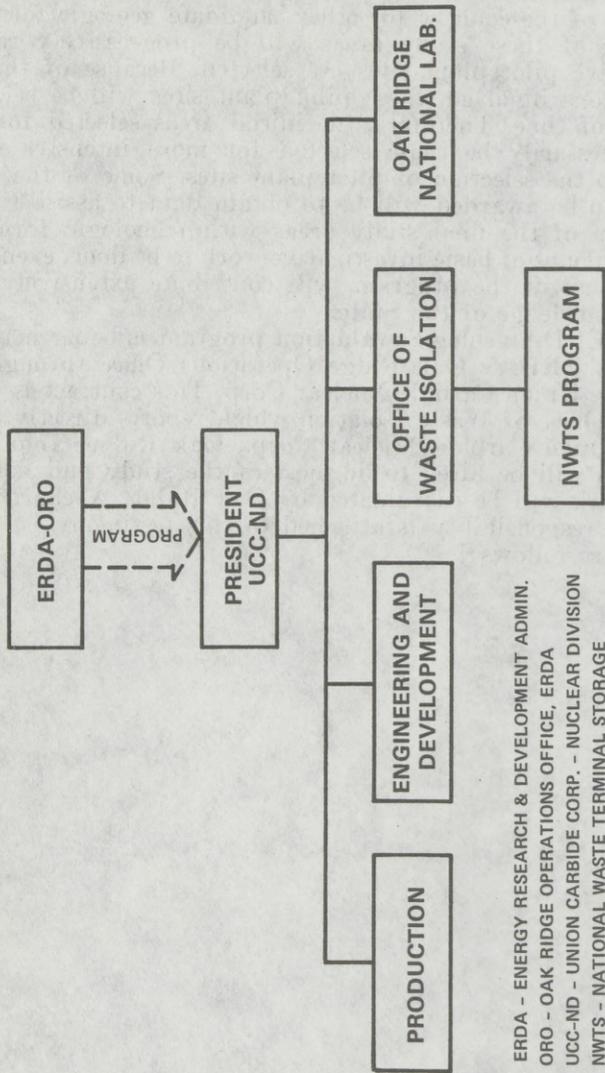
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The ERDA geologic evaluation program is being managed in the field by ERDA's Oak Ridge Operations Office through a contract with the Union Carbide Nuclear Corp. This contract is implemented by the Office of Waste Isolation which reports directly to the President, Union Carbide Nuclear Corp., Oak Ridge, Tenn. Other contractors will be hired to do most of the study and field work and this work will be coordinated by Oak Ridge. A chart showing the line of responsibility is attached to this testimony.

[Chart follows:]

PLACE INTO RECORD OF JULY 6 HEARING FOLLOWING LINE 16, P. 180

# NWTS PROGRAM LINE OF RESPONSIBILITY



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UCC-ND - UNION CARBIDE CORP. - NUCLEAR DIVISION  
NWTS - NATIONAL WASTE TERMINAL STORAGE

Dr. KUHLMAN. Although there is not sufficient time today to present the complete ERDA program, we will be reviewing this program in detail before a joint meeting of the Governor's Task Force on Nuclear Waste Disposal and his Environmental Review Board in Lansing, Mich., on July 26, 1976. We will be discussing at that meeting the general ERDA program and our approach to selecting the study areas within the continental United States.

I believe it is important to recognize that ERDA has yet to receive funds for the expanded program which I am discussing. Consequently, the terminal storage program is in a very early stage. Serious efforts will begin October 1, 1976, when the expanded budget voted by both Houses of Congress on June 29 will become available. The administration budget submitted to Congress requested an increase in research and development efforts for terminal waste storage from \$4.6 million in fiscal year 1966 to about \$34 million in 1977. The ERDA budget approved by Congress contains \$5.6 million in budget outlay in addition to the administration request. It seems reasonable to conclude that this congressional budget action indicates support by Congress of the administration's program.

Earlier in my testimony, I referred to a need for site-specific environmental impact statement for the pilot plants. In the meantime the drilling of holes for geologic data collection will be preceded by the preparation of environmental assessments. The environmental review process has already been started in a broad way. ERDA announced on May 7, 1976, that it will issue in the spring of 1977, a draft generic environmental statement on the management of post-fission radioactive wastes from nuclear power reactors. In preparation of the generic statement, ERDA has issued a 1500-page technical document abbreviated, TAD—ERDA-76-43, which will be used to select the alternatives for indepth treatment in the generic environmental statement. The geologic alternative is part of this document. A briefer summary of this document is available for easy access to the major findings of the larger documents.

Again, Mr. Chairman, I would ask permission to submit the executive summary to the large document for the record. It is very brief.

Mr. CARR. Without objection, so ordered.

Dr. KUHLMAN. TAD is being issued 1 year before the environmental statement to obtain comments of the general public. The TAD will be updated at the time the environmental statement is released in the spring of 1977. This document is not a decision document. Decisions as to particular waste management actions will be made by ERDA's technical review process with full recognition of the NEPA requirements. A program implementation document was issued by ERDA on May 8, 1976, to summarize the waste management program for fiscal year 1977 and to indicate the relationship of that program to the TAD.

Finally, Mr. Chairman, this is the last of my additions. May I submit the program implementation document for the record.

Mr. CARR. Without objection, so ordered.

[Documents referred to follow:]



ERDA-76-43

MAY 7 1976

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**Alternatives For Managing  
Wastes From Reactors And  
Post-Fission Operations  
In The LWR Fuel Cycle**

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INTRODUCTION  
AND EXECUTIVE SUMMARY

INTRODUCTION  
AND EXECUTIVE SUMMARY

(Reference: ERDA 76-43, May 1976)

INTRODUCTION  
AND EXECUTIVE SUMMARY

This document describes technologies for managing radioactive wastes from commercial nuclear power. It is directed specifically at wastes associated with what is known as "the back end of the LWR fuel cycle," i.e., activities related to handling of spent fuel after it is removed from light-water-cooled reactors (LWRs). The LWRs are currently the predominant reactor type in the commercial U. S. nuclear power industry.

The document characterizes the technologies and classifies their state of availability. It is not a decision or program document. It is strictly a baseline or reference document, technical in nature, and designed to serve as a sourcebook of information on the technologies of radioactive waste management. It is a bridge between past and future activities to develop technology for managing radioactive wastes; i.e., it describes the current status of technology and provides a basis for future action. It is assumed that the technologies to be adopted must be operable within the applicable radiation safety regulations.

ORIGINS AND FUNCTIONS OF THE DOCUMENT

This document is an outgrowth of a need for technical alternatives in preparation of an environmental statement and a request from the Joint Committee on Atomic Energy for a comprehensive report on options for managing radioactive wastes. It is also a step in ERDA strategy for fulfilling its responsibilities concerning development of commercial radioactive waste management technology. The document is responsive to the JCAE request for a discussion of options; it simultaneously provides baseline information and data for formulation of ERDA program plans and preparation of environmental impact statements. Other documents will address R&D plans; still others will address environmental impacts.

The basic purpose of this document is to provide government, industry, and the public a convenient, comprehensive and non-evaluative description of the technologies to be considered in actions such as preparation of environmental impact statements or selection of ERDA programs concerned with managing wastes from the back end of the commercial LWR fuel cycle. A document of this type is needed because there are in fact numerous alternative technologies for each aspect of radioactive waste management. This compilation of information helps assure that all alternatives are considered, and that all participants in actions to make selections have a common information base. To preserve its role as a source document, this report makes no recommendations, makes no comparative assessments

and program selections are future actions to be derived from the contents of this document and public discussion of the alternatives.

#### BACKGROUND FOR THE TECHNOLOGY ADDRESSED

Spent LWR fuel contains fissionable uranium and plutonium in concentrations that are potentially of commercial interest. To make use of these materials, the fuel would be processed to recover the uranium and plutonium; these materials would then be fabricated into fuel elements containing mixed oxides of uranium and plutonium (MOX fuel elements) which would be recycled to reactors.

If uranium and plutonium are recovered and recycled, the back end of the LWR fuel cycle is said to be closed. One alternative to this mode of operation for the back end of the fuel cycle is to regard the spent fuel as material to be stored indefinitely or discarded; this is known as the "throwaway" fuel cycle. Other alternatives involve recycle of one or the other of the fuel materials, e.g., recycle of uranium and storage of plutonium.

Radioactive materials in the back end of the fuel cycle become wastes when they are to be discarded. In their initial form, the wastes occur as a variety of solid, liquid, and gaseous materials; these are called "primary" wastes.

The primary wastes may undergo treatment prior to final disposition. For example, liquids can be converted to solids, and combustible materials can be burned in order to reduce their volume. In general, such operations are known as "treatment technologies"; there are numerous alternative specific concepts for each type of treatment.

Treatment of primary wastes produces what are known as "secondary" wastes which consist of the treated primary wastes plus any other wastes that result from the treatment process itself. Combustion, for example, generates off-gases that may be filtered prior to discharge; the spent filters, in addition to the residue from combustion of the primary wastes, become part of the secondary wastes.

In general, the treatment operations take a broad spectrum of primary waste materials and convert them to a few secondary waste types in forms suitable for transportation, handling, and final disposition. Quantities and characteristics of the secondary wastes will depend on which treatment technologies are used, which fuel cycle mode (e.g., throwaway or closed) is used, and what use is made of logistic factors such as holdup times prior to treatment.

A single, unique characterization of commercial radioactive waste management is therefore not possible. Specific fuel cycle conditions and waste management technologies must be defined from among the alternatives. This document identifies and characterizes the waste management technology alternatives; these can be regarded as alternative "building blocks" from which complete waste management systems can be assembled.

In addition to waste treatment there are three other basic waste management functions: interim storage, transportation, and final isolation or disposal. Alternatives for each are discussed in this document. The terminology is used as follows:

- Storage is "interim" when the waste is being held with anticipation of subsequent waste management action such as treatment or transportation. An example of interim storage is tank storage of liquid wastes prior to solidification.
- Transportation is movement of materials from one site to another.
- "Final isolation or disposal" is the terminology used for the alternatives for final disposition of the wastes. "Disposal" refers specifically to alternatives that offer little or no chance for reversibility. "Final isolation" refers to alternatives that isolate the wastes from mankind and the biologic environment by placing them in stable geologic media.

Some of the isolation alternatives involve disposal concepts; i.e., the wastes would be put into geologic isolation using emplacement techniques not intended to permit reversibility. Other isolation alternatives involve "final storage," which isolates the wastes from the biologic environment by using emplacement techniques that do offer opportunity for reversibility, i.e., retrieval.

Two types of geologic isolation storage can be distinguished: "provisional geologic storage," which uses emplacement techniques and monitoring operations that permit retrieval with methods and rates essentially the same as those used for emplacement, and "permanent geologic storage" from which the wastes could be retrieved using excavation and mining techniques. Repositories operated for provisional storage could be converted to permanent storage by backfilling and sealing.

This document discusses four basic types of media that can be used for geologic isolation by storage or disposal: shallow continental geologic formations, deep continental geologic formations, the sea floor, and ice sheets. It also describes two other irreversible disposal alternatives: ejection to space and transmutation, which involves bombarding the waste materials with nuclear particles or radiation in order to convert them to other isotopes. The latter two alternatives can be used only for selected waste constituents which would have to be separated from the rest of the materials in the waste that contains them.

In summary, alternatives for the back end of the LWR fuel cycle consist of options for the fuel cycle mode and options for technologies used for treatment, interim storage, transportation, and final isolation or disposal of wastes. This document describes the alternative waste management technologies and their current status. It is a technical basis for future programs, public discussion, and environmental impact statements.

#### SCOPE OF THE DOCUMENT

This document describes alternative technologies for all steps of management of all wastes for the back end of the LWR fuel cycle, including wastes from the reactors and wastes produced by decommissioning fuel cycle and waste management facilities. Technologies being developed or used in other nations are included.

The report also includes description of LWR fuel cycle alternatives, description of wastes, and projection of waste quantities. In practice, waste quantities and types, and the waste properties, will depend on many things, including the operating history of the reactors; the length of time the spent fuel is held in storage; the mode of operation of the back end of the fuel cycle (e.g., throwaway or closed); the technology, if used, for processing the spent fuel; the technology used for waste treatment, and the length of time wastes are held in interim storage. The descriptions of wastes and projection of waste quantities that are included here are estimated on the basis of known characteristics of the technologies and anticipated operating practice in the industry.

For purposes of illustrating the effect of technology and fuel cycle mode on waste quantities and properties, the report also includes overview characterizations of three alternative fuel cycle modes: operating without spent fuel processing, recycle of uranium coupled with storage of plutonium, and recycle of both uranium and plutonium. In all three cases, use of current waste management technology is assumed.

The descriptions of waste management technologies given in this document are, for the expert professional, highly condensed. Readers interested in details may consult the references or authors. References have been used extensively but without attempt to provide exhaustive compilation of the waste management literature. The references were selected to provide access to additional literature and information.

#### STATUS OF THE TECHNOLOGY

A major purpose of this report was to characterize waste management technology in terms of its state of readiness for commercial use. Another purpose was to determine if there are any areas where needed waste management technology is missing, i.e., not now available or under development. The cutoff date for characterizing the status of technologies was September 1, 1975.

The status of technologies is characterized and classified as commercialized, available, or under development. Commercialized technology is in routine use with radioactive materials for industry purposes at economic scale. Technology is "available" if its status is such that design and construction of a full scale commercial installation can be initiated; design verification tests might be required. The status of technologies under development can range from early-on concept testing in the laboratory to nearly available.

The information contained in this document shows that all technologies needed to manage radioactive wastes from the back end of the commercial LWR fuel cycle are commercialized, available, or under development; there are no gaps. Management of radioactive wastes from all options for the back end of the LWR fuel cycle can be accomplished using commercialized or available technology as defined above. Technologies for managing wastes from LWR reactors are fully commercialized. Technologies for treatment, interim storage, and transportation of wastes from fuel cycle operations such as fuel processing are commercialized, or ready for commercial-scale design and proof-testing, or can readily be implemented by adaptation of commercial practice for management of nonradioactive wastes.

The available technologies for final disposition of wastes are burial grounds and provisional storage in deep continental geologic formations. Stable geologies expected to be suitable for deep geologic isolation are known, technologies for site exploration and site selection are available, and design principles for waste repositories are known. Repository designs and qualification procedures will be specific to the site being considered; they can be developed as necessary when candidate sites are identified.

The technologies under development provide alternatives to existing technology. Implementation of the developing technologies would be expected to provide benefits such as reduced environmental impacts, simplified procedures, and reduced costs in comparison with existing technology. Comparative assessments of existing and developing technologies can be made as information from the development work becomes sufficient for such evaluations.

#### DOCUMENT STRUCTURE

This document is structured to reflect the four basic waste management technologies of treatment, interim storage, transportation, and final isolation or disposal. Volume 1 includes, in addition to the Introduction (Executive Summary) and a Technical Summary, background information on the LWR fuel cycle alternatives, descriptions of waste types, and projections of waste quantities. Volume 1 also contains the overview characterizations of alternative LWR fuel cycle modes.

Volume 2 describes alternative waste treatment technologies. Volume 3 describes alternatives for interim storage and transportation. Volume 4 describes final isolation and disposal alternatives. The Appendices, Volume 5, provide supporting information, with emphasis on continental and sea floor geologies.

TECHNICAL SUMMARY

This is a technically oriented summary of this document, which describes alternatives for managing radioactive wastes from reactors, spent fuel storage basins, fuel reprocessing plants, and mixed-oxide fuel fabrication plants in the fuel cycle for light-water-cooled commercial reactors (LWR's). In commonly used terminology, the document describes waste management alternatives for the back end of the commercial LWR fuel cycle.

This document characterizes the technologies and classifies their status; it is not a decision or assessment document. It is a digest of technical information on waste management alternatives which is expected to serve as a basis for future decisions, assessments, and environmental impact statements. It is assumed that technologies to be adopted must be operable within the applicable radiation safety regulations. Because of its focus on the back end of the commercial LWR fuel cycle and its role as a reference document, the document does not:

- . address pre-fission waste management issues
- . address management of noncommercial (e.g., Defense) wastes
- . address environmental impact issues
- . select a preferred commercial waste management system
- . estimate and compare costs
- . estimate and compare safety and risks.

The scope of this document does include:

- . identification and characterization of wastes from the back end of the commercial LWR fuel cycle
- . projection of waste quantities
- . identification and description of alternative technologies for treatment, interim storage, and transportation of wastes
- . identification and description of alternatives for final storage and disposal
- . overview characterization of three alternative fuel cycle and waste management systems:
  - operation without fuel reprocessing ("throwaway" fuel cycle)
  - recycle of uranium, storage of plutonium, and use of available waste management technology
  - recycle of uranium and plutonium; use of available waste management technology.

These characterizations illustrate comparison of alternative LWR fuel cycle modes operated with the same waste management technology. Technologies which are not now ready for application but which show promise of economic, environmental impact, or operational benefits are

candidates for research and development and detailed assessment of their effects on fuel cycle and waste management characteristics and impacts.

The alternative waste management technologies are discussed in terms of four basic waste management activities:

- Treatment, which converts the wastes from their as-generated form to forms needed for handling, transportation, and final disposition of the wastes. As-generated wastes are termed "primary wastes"; wastes that emerge from treatment operations are "secondary wastes."
- Interim storage, which provides retention of primary and secondary wastes while they are in man's environment and subject to subsequent management activities such as treatment or transportation.
- Transportation, which is applied to movement of waste materials between sites.
- Final isolation or disposal, which provides final disposition of wastes. The basic alternatives are isolation in geologic media or elimination of the wastes from existence on earth.

Anticipated waste types, quantities, and characteristics for the commercial LWR fuel cycle are summarized in Figure 1. Actual waste quantities will depend on the specific technologies used in fuel cycle operations and waste management. Values given in Figure 1 are representative of current practice. Waste types and radioactivity characteristics shown in Figure 1 are expected to be generally representative of primary wastes generated by the commercial LWR fuel cycle.

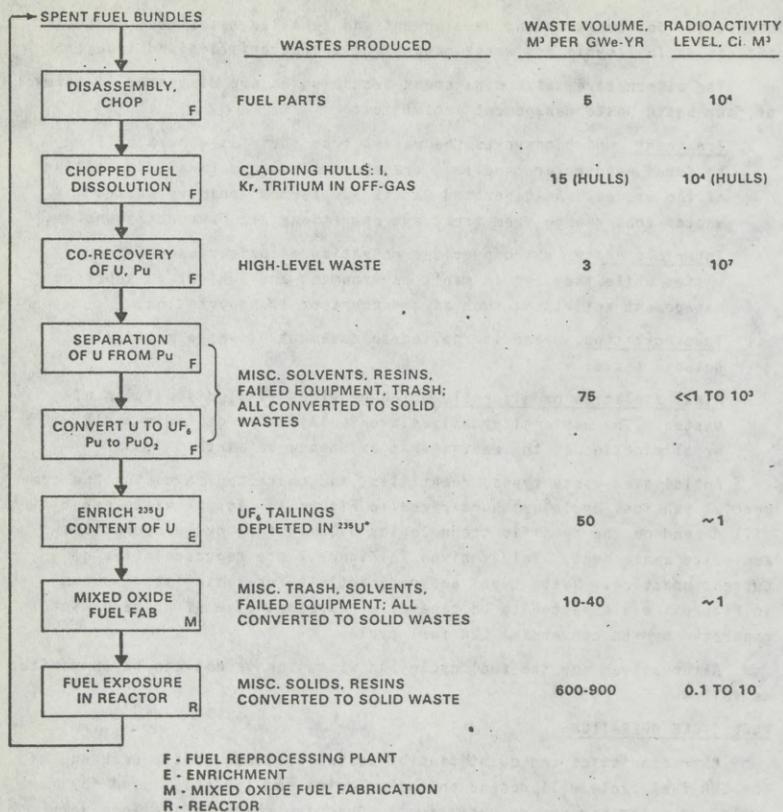
Alternatives for the fuel cycle and waste management can be summarized as follows:

#### FUEL CYCLE OPERATIONS

Characteristics and quantities of wastes produced in the back end of the LWR fuel cycle will depend on technologies and logistics used for fuel cycle and waste management operations. Overview characterizations were developed for three basic alternatives, each of which was assumed to use available waste management technology:

- No recycle of uranium or plutonium.
- Uranium recycle only (plutonium is stored).
- Recycle of uranium and plutonium.

Waste management requirements for these alternatives differ in detail. The two recycle options are, within the framework of assumptions used, similar with respect to impacts on waste management: both require fuel reprocessing and its comparatively strong impact on waste quantities and characteristics. Recycle of plutonium in addition to uranium involves



\*NOT DISCUSSED IN THIS DOCUMENT

FIGURE 1. Process Operations and Wastes in the LWR Fuel Cycle

addition of mixed-oxide fuel fabrication plants to the fuel cycle; such operations have minor effect on waste quantities. The "throwaway" fuel cycle (no recycle of plutonium or uranium) minimizes waste quantities but maximizes inventories of long-lived alpha particle-emitting nuclides in the wastes. Detailed comparative assessments of these alternatives have not been made and are not within scope of this document.

#### IRRADIATED FUEL

The technology is available and in use for interim storage and transportation of irradiated LWR fuel. If the irradiated fuel becomes a waste, i.e., if the uranium and plutonium in spent fuel are not returned to the fuel cycle, then the fuel assemblies can be stored or managed as a waste, e.g., by placing them in containers and filling the void space with metal. Such technology is available but has not been used.

#### CHOP-LEACH FUEL BUNDLE RESIDUES

The chop-leach fuel bundle residues are solid wastes comprising short lengths of fuel cladding, fuel bundle support rods, poison rods, massive end fittings, fuel support grids, assorted springs, and spacer elements. Between 0.05 and 0.5% of the original fuel material remains with these wastes as an insoluble residue. The available technology is to store these wastes without treatment. The small amount of chop-leach fuel bundle residue wastes generated in the U.S. to date, at the Nuclear Fuel Services Plant, was packaged in steel containers and placed in shallow geologic isolation (burial grounds).

Advanced technology is being developed to decontaminate and/or consolidate these wastes by mechanical compaction, by melting, or by chemical reaction.

#### HIGH-LEVEL LIQUID WASTE

High-level liquid waste (HLLW) is generated in the first solvent extraction cycle of nuclear fuel reprocessing facilities. Because HLLW can contain over 99.9% of the nonvolatile fission products and more than 50% of the actinide activity in the wastes from the back end of the fuel cycle, significant amounts of research, development, and engineering resources have been applied to this waste.

No LWR fuel cycle HLLW has yet been generated in the United States except for a small amount generated at the Nuclear Fuel Services plant at West Valley, New York, during the years 1966-1972. That waste is now in storage. Present regulations require that when more commercial HLLW is generated in the U.S. it must be converted to a stable, dry solid within five years after fuel reprocessing.

Technology exists to convert the HLLW to a calcine powder or a glass. ERDA wastes, which differ chemically from LWR fuel cycle wastes and have lower levels of radioactivity, have been calcined routinely at the Idaho National Engineering Laboratory since 1963. A production-scale facility for converting HLLW to glass, under construction at Marcoule, France, is scheduled to begin operation in 1977. Several alternative methods for converting HLLW to a glass are being developed in the U.S. within ERDA programs.

#### NON-HIGH-LEVEL LIQUID WASTES

This classification includes a wide variety of waste types. Some plant wastes, such as laundry and decontamination solutions, are common. But the category also includes wastes specific to certain plants, such as acid etch solutions from a mixed-oxide fuel fabrication plant or alkaline solvent wash solutions from a fuel reprocessing plant. Thus the non-high-level liquid waste category encompasses a broad spectrum of radioactive liquid wastes varying widely in chemical and radioactive content.

Because of the diversity of non-high-level liquid waste types and because the goal is usually to clean large volumes so that the water can be released as a plant effluent, a sequence of treatment processes is usually required. The treatments are relatively conventional technology. In addition to evaporation, which is the most commonly used treatment technology, treatments can include reverse osmosis, flocculation, precipitation, filtration, and ion exchange. The technologies are all available, and most are currently being used in the nuclear industry.

Certain non-high-level liquid wastes, such as waste solvent from a reprocessing facility, are flammable. Technology is available for the incineration of these wastes.

#### IMMOBILIZATION OF NON-HIGH-LEVEL WASTES

Virtually all nuclear fuel cycle operations generate liquid or solid wastes requiring immobilization prior to transportation and storage. Many alternative technologies are currently in use to immobilize these wastes. The alternative technologies include the use of absorbents and the incorporation of the wastes in concrete, asphalt or urea-formaldehyde resin.

Absorbents have been used widely in both the chemical and nuclear industry to immobilize liquids for transportation and disposal. Some of the typical granular or powdered absorbent materials include vermiculite, silica gels, plaster of paris, and various clays. The absorbent method, properly applied, will entrap the waste liquid so that no free liquid exists within the bulk material.

Incorporation of radioactive wastes in cement or concrete has been a common practice for many years. The optimum proportions of cement and waste vary with the type of waste to be solidified. Maximum waste contents for the solidified products are typically 75 wt% for solid waste or 33 wt% for aqueous solutions or slurries.

Commercialized technology is available for the immobilization of a wide variety of wastes in asphalt, or bitumen, including neutralized evaporator concentrates, sludges, ion exchange media, and incinerator ashes. Both batch and continuous processes are in use, particularly in Europe.

Systems for immobilizing reactor wastes in urea-formaldehyde have been marketed commercially since 1972.

#### COMBUSTIBLE SOLID WASTES

Combustible solid radioactive wastes include a large variety of items such as paper, rags, plastic sheeting, protective clothing, gloves, rubber shoes, wood, organic ion exchange resins, filter aids, etc. Much of the waste material is collected as general trash, which usually consists of a mixture of combustible and noncombustible items. Therefore, treatment options generally include sorting prior to treatment of the wastes.

Waste compositions vary depending on the operations involved. General trash, or non-glove box waste, includes mainly cellulosic materials such as paper, wood, cardboard, absorbent cotton, cotton clothing, and rags. Usually these materials burn readily to release water vapor and carbon dioxide. Glove box-generated wastes, on the other hand, contain chiefly rubber or plastic materials since cellulosic materials are mostly excluded from glove box operations.

Various treatment technologies are available for combustible wastes. They range from simple storage in boxes or steel drums to compaction, encapsulation in concrete, and incineration.

Compaction or baling is a mechanical operation for reducing the volume of the waste. For a typical combustible waste, a volume reduction of 5- to 10-fold can be expected. Shredding of the waste before compacting is sometimes done to increase the volume reduction ratio.

Some combustible wastes have been immobilized by mixing with concrete. An example of this type of operation is the incorporation of dewatered ion exchange resin in cement.

The incineration of combustible waste is simple in principle but requires special considerations when applied to radioactive materials. The most important of these considerations have been associated with the

off-gas cleanup system. A number of alternative incineration systems are being developed and evaluated in the U.S. These systems include simple single-chamber units, fluidized beds, moving grates, and rotary kilns. The operational modes include excess air incineration, controlled air incineration, and acid digestion.

#### NONCOMBUSTIBLE SOLID WASTES

The primary constituent of these solid wastes is metal, but other noncombustibles such as glass and concrete are also present. Incidental quantities of combustible material such as grease, plastic, and floor sweepings may also be present with the noncombustible waste.

Examples of items that become noncombustible wastes are inoperable and obsolete process equipment such as pumps, process vessels, piping, and laboratory or process glove boxes. These large items present a unique waste management problem due to size and, in some cases, high radiation levels. Small items also in this waste category include filters, broken glassware, and shielding material.

The smaller noncombustible solid waste items are often associated with combustible materials. As an example, plant maintenance activities such as replacement of a process valve will contaminate plastic, rags, and other combustible items, thus requiring a prepackaging sorting or segregation operation.

The steps in management of large noncombustible waste items are decontamination, disassembling, and packaging. Commercialized technology is available for these steps. Decontamination usually includes chemical flushing with several different reagents but may also include mechanical activities. Disassembling may be done by sawing or mechanical cutting or tearing, as well as cutting with torches or electric arc. Packaging can be done either with or without crushing or mechanical compaction.

Advanced alternatives being developed for the future are directed toward decreasing the final volume of these wastes and decreasing the individual mechanical operations required in their treatment. These alternatives include melting and dissolution.

#### GASEOUS WASTES

Gaseous wastes include radioactive noble gases, iodine, tritium and carbon-14. Treatment technology is available for the noble gases and iodine, and is being developed for tritium and carbon-14. The technologies being developed for tritium and carbon-14 are to meet a possible future need; their present release rates do not require treatment under present regulations.

Two technologies are available to collect noble gases from off-gas effluents. One is the cryogenic treatment of the entire off-gas stream followed by distillation of the resultant liquified air for purification of the noble gas fraction. This technology is currently used at the Idaho Chemical Processing Plant (ICPP). The second technique is collection by liquid fluorocarbon absorption. This technology is presently being offered commercially for capture of noble gases released from light water reactors.

At present, captured noble gases are stored in pressurized gas cylinders. Development is currently underway on encapsulating noble gases in a sodalite-zeolite matrix. The advantage of the zeolite encapsulation is that long-term storage of noble gases does not depend on the integrity of pressure vessels.

Iodine can be removed from effluent off-gas streams by using one of many available technologies which include caustic scrubbing, chemisorption by metal-loaded absorbents, mercuric nitrate-nitric acid scrubbing, and iodox scrubbing. The choice of technique depends on the nature of the off-gas stream to be treated and the desired final product form of the captured iodine.

#### DECONTAMINATION AND DECOMMISSIONING OF RETIRED FACILITIES

Facilities contaminated in fuel cycle operations can become a major waste quantity upon retirement. Three alternatives for decommissioning contaminated facilities have been identified in Regulatory Guide 1.86 of the Nuclear Regulatory Commission. The alternatives are protective storage, entombment, and dismantling.

Protective storage is often referred to as mothballing. In this decommissioning alternative the facility is prepared to be left in place safely for an extended period which might range from decades to two or three centuries. Potentially mobile radioactive materials are removed from the site. All operational systems and support utilities are placed in a nonoperation mode. A continuous surveillance program is established.

Entombment involves all the decommissioning steps of protective storage but in addition provides for sealing all contaminated facility components in a high-integrity structure. Such contaminated components might include the pressure vessel and internals of a light water reactor or the major processing vessels of a reprocessing facility.

The dismantling alternative involves removing from the facility site all radioactive components and materials which exceed the criteria for unrestricted release. Once all the radioactivity is gone, all restrictions on the site are removed. This mode of decommissioning may be applied

immediately after facility retirement or following a period of protective storage to allow decay of short-lived radionuclides.

All three of the decommissioning alternatives have been employed. For example, four reactors at Hanford and the Fermi reactor in Michigan have been placed in protective storage and are currently in this status. The Hallam nuclear power facility near Hallam, Nebraska, has been entombed. After shutdown in 1968 the reactor at Elk River, Minnesota, was dismantled and the reactor site was returned to unrestricted use. Other facilities have also been subjected to these decommissioning technologies.

#### INTERIM STORAGE OF WASTE

There are several points during the operational sequence of an integrated waste management program at which interim storage should or can be provided for various waste forms. The interim storage may be a holding, or surge, point between operations, as is the case with interim liquid storage of both high-level and intermediate-level wastes. Interim storage may also be a holding point for final solid waste products prior to final isolation or disposal.

Interim storage facilities are designed to minimize radiation exposures to man and to provide confinement of the waste for as long as necessary. At the end of the interim storage period for solid wastes, the waste containers must be capable of being retrieved and transported to future treatment or storage sites, preferably without need for repackaging. Consideration must also be given to protecting the waste from accidental intrusion, vandalism, and other adverse acts.

Interim storage has been used for wastes representative of all of the wastes from the back end of the LWR fuel cycle, either commercially or in ERDA facilities. The storage technologies include tank storage of liquid wastes, water basin storage of spent fuel elements, and warehouse and other engineered surface storage of solid wastes. Retrievable surface storage of solidified high-level wastes has been investigated but not implemented.

#### TRANSPORTATION

Transportation of nuclear material is required between operating facilities in the nuclear fuel cycle. These transportation steps include movement of spent nuclear fuel from the reactors to reprocessing facilities, movement of nuclear waste from a reprocessing facility to a Federal repository, and movement of recovered plutonium, all of which must be done within the Department of Transportation regulations.

#### Transportation of Spent Fuel

The technology and hardware to transport spent light water reactor fuel is in use. Truck casks and rail casks are presently available. Most of

these casks will accept PWR or BWR spent fuel with a slight change of the casks internals.

#### Transportation of Waste Forms

The nuclear waste forms that require transportation include solidified high-level waste, chop-leach fuel bundle residues, and non-high-level solid wastes.

To date no solidified high-level waste has been generated by the commercial sector of the industry; therefore, none has been shipped. Conceptual designs are available for heavily shielded shipping casks to transport this waste form. These casks will be similar to currently available spent fuel casks.

Also to date, no chop-leach fuel bundle residues have been required to be shipped offsite. Thus no shipping containers specifically designed for these wastes are presently available. The wastes can, however, be shipped using conventional radioactive shipping container technology.

Non-high-level waste is generated at all back end fuel cycle facilities. To accommodate the various waste forms in this category, several waste transportation containers and casks have been developed, licensed, and are commercially available today. Special non-high-level waste forms may be generated that require new casks, but these new casks can be developed with existing technology.

Plutonium is separated from spent fuel at a reprocessing facility. The separated plutonium is then shipped to a fuel fabrication plant. By regulation, all plutonium shipped after June 1978 will be in a solid form. Small quantities of plutonium are now being shipped routinely. Advanced plutonium cask designs are presently being developed to accommodate the larger quantities of plutonium that will require transportation in a mature industry. These developments would also be available for wastes containing plutonium.

#### FINAL ISOLATION AND DISPOSAL

There are two basic alternatives for final management of wastes generated by the commercial LWR fuel cycle: 1) geologic isolation and 2) elimination from existence on earth. Geologic isolation, that is, placement in geologic formations, offers two options: storage, which provides for retrieval of wastes after emplacement, and disposal, which uses emplacement techniques based on anticipation that the wastes would not be retrieved.

Two elimination alternatives have been defined: extraterrestrial ejection by rocket, and transmutation, in which nuclides are bombarded by nuclear particles or radiation with the objective of efficiently

converting the bombarded nuclides to new species that will decay more quickly and/or emit less hazardous radiation.

The elimination options can be used only for selected waste components. The separations technology needed has not been developed.

The fundamental concept for geologic isolation is emplacement of wastes in geologic media expected, because of their stability, to maintain isolation for as long as necessary. Geologic isolation could be further augmented if the geologic medium has capability to retard nuclide migration.

Four basic geologic environments have been identified as candidates for isolation of radioactive wastes: the sea floor, ice sheets, formations under the continents at depths isolated from the biosphere, and shallow continental geologic formations used as burial grounds.

With present technology, opportunities to use these geologic isolation alternatives can be summarized as follows:

- . For ice sheets, additional geologic and meteorologic data are needed.
- . Disposal in geologic formations in the sea floor is being investigated. The technical information base is at present insufficient, but all information available to date is supportive of the concept.
- . Emplacement in burial grounds, i.e., shallow geologic formations, has been used in the past and is anticipated for the future. Past use of this concept has not fully utilized a systematic approach to isolation in shallow geologic formations; practice is being improved.
- . Numerous concepts for disposal in deep geologic formation (i.e., emplacement without anticipation or retrieval) have been defined. Most concepts are feasible with current technology, but long-term post-emplacement stability has not been evaluated.
- . Deep continental geologic formations suitable for disposal or permanent storage have been identified. Procedures and technology for selecting specific repository sites are available, and conventional engineering practice can be used to design repository systems.

Geologic storage or disposal relies on the geologic medium to serve as a stable barrier that keeps the wastes isolated. The geologic barrier can be augmented by selecting waste forms and engineered structures that contribute to the stability of the system and, in storage systems, provide capability for waste retrieval.

Design of geologic isolation repositories is specific to the site, geologic medium, and characteristics of the wastes to be emplaced. Factors considered in the design of waste handling facilities and emplacement configurations include size and shape of the waste containers; heat and

radiation emissions from the waste; chemical, thermal, mechanical, and radiation interactions between the waste and the geologic medium; and requirements for operational safety. Repositories can be excavated using conventional mining technology.

Repositories can be initially designed for "provisional" geologic storage; i.e., they can be designed for waste retrieval using methods and rates essentially the same as those used for waste emplacement. Such repositories can also, after a period of operation during which data are taken and evaluations are made to test long-term stability, be converted to "permanent" geologic storage by backfilling and sealing.

MAY 7 1976



PROGRAM IMPLEMENTATION DOCUMENT

ERDA'S PROGRAM FOR MANAGEMENT OF  
RADIOACTIVE WASTE FROM COMMERCIAL NUCLEAR  
POWER REACTORS

ERDA's Program for Management of  
Radioactive Waste from Commercial Nuclear  
Power Reactors

Introduction

In April 1975 ERDA announced its decision to withdraw its draft environmental statement on commercial radioactive waste management. At the same time, ERDA also announced that it was withdrawing its proposed project to construct a Retrievable Surface Storage Facility for storage of radioactive waste until a permanent storage facility had been established. Subsequently the Joint Committee on Atomic Energy requested ERDA to prepare a "comprehensive and detailed analysis of the options for storage or disposal of commercially generated radioactive wastes in the 1975-2000 and beyond time intervals." These actions led to a complete reevaluation and redefinition of ERDA's radioactive waste program. This document presents the result of that effort and the plan ERDA proposes to follow in providing for the safe terminal storage of radioactive waste from nuclear power reactors.

ERDA's Commercial Radioactive Waste Management Program

On November 17, 1975, ERDA announced the preparation of a document on technical alternatives for management of commercial radioactive waste. This document stated in part

"This report will provide in a convenient form a baseline of information about waste management. As such, it will be used to choose the waste management alternatives to be given detailed consideration in the expanded commercial radioactive waste management environmental statements which ERDA announced in April 1975, to replace the draft statement issued in September 1974 (WASH-1539)."

On May 7, 1976, ERDA issued its report "Alternatives for Managing Wastes From Reactors and Post Fission Operations in the LWR Fuel Cycle" (ERDA-76-43). The issuance of this technical alternatives document (TAD) is one of several major steps in ERDA's plan to provide for the safe management and permanent

storage of radioactive waste. Combinations of alternatives presented in TAD can be selected to analyze integrated waste management for the total back end of the fuel cycle.

TAD is a reference document which provides major input on alternatives for the environmental statement on commercial radioactive waste management. This radioactive waste could be in the form of spent fuel elements and waste generated from the processing of nuclear fuels. The environmental statement will be prepared and issued in draft form in the Spring of 1977. ERDA is seeking public comment on TAD for consideration in the preparation of this environmental statement.

Since TAD is a condensation of technology, it was necessary to establish a cutoff date of September 1, 1975 for the report. TAD will be revised and reissued in early 1977 to provide an up-to-date compilation of waste management technology to accompany the commercial waste management environmental statement.

Another major step in ERDA's waste management plan is the submission and support of a strong budget for commercial radioactive waste management. ERDA announced earlier a major expansion in its research and development programs for the management of commercial radioactive waste. The ERDA budget on these programs has been increased from \$12 million in FY 1976 to \$60 million in FY 1977. Technologies and programs supported by this budget are presented in Enclosure 1. In all cases specific technologies addressed and supported in the FY 1977 budget are discussed in detail in TAD.

The major budget increase is in the effort to select sites for geologic isolation of wastes. ERDA's goal is to have a Federal pilot plant facility ready to receive wastes in the mid-1980's. Major support is directed at those technology options which can be brought to design on a timely basis. Other technologies requiring further development but not available for use in the near future are also supported.

Because of the massive amount of technical data in TAD, a public meeting to discuss this information and present in a summary fashion the current status of waste technology will be held in Denver, Colorado, on July 11-16, 1976. Besides presenting to the public current data on waste technology, the first day of the meeting will be devoted to discussions on radioactive waste programs from a number of countries by top officials from these countries. In addition, presentations will also be made by appropriate officials of U.S. agencies having responsibility for various aspects of radioactive waste management.

In addition to the technical aspects of waste management, a number of social issues have been raised. To provide a forum to discuss these issues, a national meeting is planned for the Fall under the sponsorship of the Council on Environmental Quality, National Science Foundation, and ERDA. An announcement on details for this meeting will be made at a later date.

Review of the TAD, ERDA's waste budget and testimonies before Congressional committees, and the forthcoming public meetings on waste management should provide an opportunity for the public to identify and express their concerns. Those concerns will be considered by ERDA in the preparation of the draft environmental statement on commercial waste. An outline for this environmental statement will be issued for public comment in the near future.

ERDA has established a program management organization in Oak Ridge, Tennessee, to assist in the administration of the expanded effort on isolation of waste in geologic formations. Open meetings will be held with prospective contractors on the expanded program and the concepts of contracting management. Proposals will be requested on specific parts of the program.

In conclusion, ERDA is conducting a major program to provide for the safe management of commercial radioactive wastes and to involve the public in planning and decision-making processes of this program.

ERDA is confident that the technological base and overall capability does exist within the U.S. to arrive at solutions and its radioactive waste program is directed to develop this capability on a timely and acceptable basis.

5/4/76

Enclosure 1ERDA's FY 1977 WASTE MANAGEMENT BUDGET

The program basic to the Fiscal Year 1977 budget for commercial waste management was established with particular attention to the state of available technology, the then-current level of effort and the dates at which additional waste management capability would be required. Technology requirement dates were considered both for the processing case and for the case of a negative Nuclear Regulatory Commission decision on plutonium recycle and hence no processing of spent fuel. Since the fuel cycle with processing of spent fuel has greater need for additional waste management, that case predominates in the proposed program for FY 77. The obligation to provide a Federal Repository for high-level radioactive wastes must be satisfied irrespective of the existence of a spent fuel processing industry.

In general terms the ERDA FY 77 budget provides for development of technology to satisfy all the needs found in a comprehensive review of the fuel cycle, with priorities given to those approaches which the present state of development promises will be applicable in time to satisfy the needs of the fuel cycle. The program is described below in two parts. The first -- terminal storage -- concerns the final disposition of waste. The second part of the program -- waste processing -- provides for the development of technology for the collection and treatment of the waste to provide packages that can be handled, transported, stored, and

eventually given permanent disposition, all within applicable radiation safety regulations. A comprehensive generic environmental impact statement on these commercial radioactive waste management activities will be issued, as a prelude to decisions concerning systems which will be ultimately used, and there will be additional statements for specific projects.

To show the scope of the two parts of this program, Table 1 shows various classes of waste from the back end of the fuel cycle for which management technology must be available.

Table 1

SOURCES OF RADIOACTIVE WASTE FROM BACK END OF FUEL CYCLE

<u>Class</u>	<u>Point(s) of Origin</u>
Spent fuel*	Reactors
"Hulls" and fuel bundle residues	Spent fuel processing plants
High-level liquid waste	Spent fuel processing plants
Non-high-level liquid waste	All facilities**
Combustible solid waste	" "
Noncombustible solid waste	" "
Gaseous and volatile materials in effluents	Reactors, spent fuel processing plants
Decontamination and decommissioning wastes	All facilities**

\* would be a high-level waste on contingency of negative Pu recycle decision.

\*\* reactors, spent fuel processing plants, (recycled) fuel fabrication plants.

Consideration of these classes of waste is outlined in the waste processing section of this enclosure in the order listed. In addition to final disposition and waste processing, discussions of interim storage and transportation, as they relate to the FY 77 budget, are included.

The President's Fiscal Year 1977 budget increases the ERDA commercial radioactive waste program from \$12.0 million to \$60.0 million. The expanded program includes an effort using existing geologic, mining, and engineering technology to identify sites for repositories in several regions of the contiguous 48 states. The sites will be selected on bases of stability and physical characteristics of the geologic media and on many other factors of safety and economy considered for all types of nuclear facilities. The program has a target date of the mid-1980's for having at least one geologic repository ready to begin a test phase of operations to confirm the acceptability of the site as the permanent geologic isolation location. It is assumed acceptance criteria will be available by that time.

Other key specific milestones in the expanded program include having the technology ready so that a plant could be built and operated by 1983 to solidify high-level liquid radioactive waste from commercial spent fuel processing plants. Other (later) plants would have similar capability to permit timely conversion of the high-level liquid wastes. By 1985,

processes to significantly reduce, or eliminate, gaseous and volatile radioactive materials from commercial fuel cycle plant effluents would be demonstrated for application if needed. By 1979, a family of incinerators would be demonstrated and available for application in the treatment of waste from various nuclear fuel cycle operations.

#### FINAL DISPOSITION OF WASTE

Three general conceptual alternatives may be considered for the final disposition of waste generated by the commercial nuclear fuel cycle:

1. Geologic isolation on land
2. Geologic isolation beneath the floor of the sea
3. Elimination from existence on earth by extraterrestrial disposal or transmutation

While work is supported in FY 77 at ERDA on isolation beneath the floor of the sea and on separation of more hazardous radionuclides from waste (a prerequisite to the elimination alternatives), emphasis is placed heavily on the land geologic isolation option because of its greater promise of early attainability.

Geologic isolation on land at depths reachable by conventional mining methods offers the option of a test period in which the waste would be readily retrievable. The waste would be left in place permanently only after successful completion of the test period which will follow a

thorough investigative period involving ERDA, ERDA contractors, and other Federal and State agencies.

In February of 1976, ERDA announced its decision to greatly increase the proposed budget level of effort devoted to its long-standing goal of placing commercial high-level waste in deep continental geologic formations. This decision focuses effort on this option, which has the highest probability of acceptably meeting the needs of the nuclear fuel cycle by 1985, the earliest date anticipated for receipt of high-level waste. Use of the other options has not been foreclosed. Development and assessment of them will continue but none offers the promise of a near-term complete solution to the degree geologic isolation does.

This expanded effort involves a parallel site exploration and evaluation program intended to lead to several repositories. A complete site specific environmental impact statement will be prepared for each repository prior to construction. Geologic formations expected to be suitable include salt (bedded and domed formations); argillaceous material such as clay, mudstone, and shale; and rocks such as limestone, granite, and basalt.

The geologic medium should serve as a stable barrier that keeps the waste isolated. During the early or pilot phase of the geologic repository, the waste form, the waste container, and engineered structures or fittings within the repository will all be selected to facilitate safe operation,

the making of test measurements, and the ready retrieval of the waste if necessary.

Geologic isolation repositories are expected to be converted to the permanent phase by backfilling and sealing of the mined cavities. The timing of this would depend upon the various test and evaluation programs intended to give reasonable confirmation that leaving the waste permanently in place would not have effects threatening the integrity of the isolating formation. Under the Energy Reorganization Act of 1974, the facilities for the final disposal of high-level waste by ERDA requires a license from the Nuclear Regulatory Commission and the decision to convert a geologic high-level waste repository from the test phase to the permanent phase would thus require NRC approval.

The ERDA program for commercial radioactive waste for FY 1977 includes \$880,000 for systems analysis and methods of risk assessment associated with alternatives for the final disposition of waste, and \$33.7 million for the geologic isolation of waste.

Low-level solid radioactive wastes are disposed of by burial in commercial burial grounds. These burial grounds are operated by commercial firms and are regulated either by the NRC or by states under agreement with NRC. ERDA has been reviewing its own burial ground operations relative to the safety of existing operations, methods to correct unsatisfactory

conditions, and criteria for establishing possible new burial grounds. The results of these studies are being made available to the industry and to appropriate regulatory groups for application to commercial burial grounds.

The proposed FY 77 level of effort for such ERDA studies of its own burial grounds is \$3.0 million.

#### INTERIM STORAGE AND TRANSPORTATION OF WASTE

Although permanent geologic isolation options are emphasized in the FY 77 program, the development of the Retrievable Surface Storage Facility concept will be completed to provide an additional contingency against unexpected developments in the geologic isolation program.

An allotment of \$520,000 is provided in the FY 1977 commercial waste management budget for the RSSF program.

An additional \$750,000 in the FY 77 budget will support investigation of methods for retrievable storage of transuranium-contaminated waste, which would no longer be given shallow burial if a proposed Nuclear Regulatory Commission regulation is adopted.

Technology is available and in use for the interim storage and transport of spent (irradiated) LWR fuel. If the owners of spent fuel decide not

to process it, it would be a special case of high-level waste. Preliminary evaluations do not indicate any major difficulties in developing repositories (either interim storage or geologic isolation) with enough flexibility for acceptance of either spent fuel or waste canisters from a spent fuel processing plant. Hence no funding is provided in the FY 77 commercial waste budget for the "throwaway" fuel cycle option.

The technology and hardware to transport spent light water reactor fuel is currently in use. Casks for both truck and rail shipment are available, and regulatory approval of such units for movement by commercial carriers is routine. Transport of solidified high-level waste in similar equipment is not expected to provide any new problems. A variety of shipping containers are commercially available for non-high-level solid waste and new containers for any new special forms of such waste can be developed with existing technology.

There are no programs of transportation research and development in the FY 77 commercial waste budget, but in another budget ERDA is supporting a series of severe transport accident tests to further confirm existing cask design criteria. The results of these tests, which expose containers to stresses far beyond those specified in the Department of Transportation regulations, would be applicable to either spent fuel or high-level waste casks.

WASTE PROCESSINGChop-Leach Fuel Bundle Residues ("Hulls")

"Hulls" consist of pieces of the highly corrosion-resistant fuel cladding and other components of fuel elements. They are radioactive by virtue of their prior activation by neutrons in the reactor, as well as by the presence of small bits of fuel not removed by the acid dissolving process. Hulls generated to date from nuclear power reactor spent fuel processing have been packaged in steel drums and given shallow burial. It is considered likely that hulls would have enough associated trans-uranium radioactivity to require transfer to Federal custody (like high-level waste) under a proposed NRC regulation.

Technology development is being supported in the ERDA R&D program to decontaminate and/or to consolidate hulls by chemical reaction, melting, or mechanical compaction to reduce the potential hazard of the waste in later handling or storage. Another alternative is to incorporate the unconsolidated material in concrete.

The FY 77 ERDA commercial waste budget includes \$940,000 for the various research and development projects for treatment of hulls.

High-Level Liquid Waste (Solidification)

High-level liquid waste (HLLW) is the primary waste stream from the spent fuel processing plant, and can contain over 99.9 percent of the nonvolatile

fission products plus most of the unrecovered transuranium elements. Because of this high concentration of waste radioactivity in one stream of relatively small volume, major amounts of research, development, and engineering resources have been applied to the treatment, storage, and eventual isolation of this waste.

Basic technology exists to convert HLLW into a calcined powder or a glass. ERDA defense program high-level liquid waste has been calcined routinely at the Idaho National Engineering Laboratory since 1963, although this waste differs somewhat chemically from LWR fuel cycle waste and has lower levels of radioactivity. Several alternative methods for converting HLLW to glass and other product forms are being developed within the ERDA program as a follow-on to earlier pilot-scale work in the Waste Solidification Engineering Prototype (WSEP) facility at Hanford. The current effort is directed to satisfying the technological needs of near-term processing plants as well as to exploring newer technologies that could be applied in future spent fuel processing plants.

In addition to the process development a comprehensive analytical and laboratory program will be carried on which supplies data for risk analysis, basic data on properties of glasses and other product forms, and other basic data and information required by the program.

The FY 77 ERDA commercial waste research and development program includes \$11.0 million for solidification of high-level liquid waste.

#### High-Level Liquid Waste Separations

The incorporation of additional steps in the spent fuel processing plant to allow separation or partitioning of high-level liquid waste, separating the long-lived transuranics from the shorter-lived fission products, has been investigated. All of the partitioning technologies investigated (solvent extraction, ion exchange, or precipitation) will require further development if they are to be used because at present separations are not sufficiently good to allow the fission product fraction to be handled as being free from transuranium content.

The processes that are currently theoretically possible for this partitioning appear to be costly, and with questionable benefits in view of the extreme compactness of solidified nonpartitioned high-level waste provided by present technology. Over a long term, new developments in chemical technology or in waste disposal methods might alter these conclusions.

The ERDA FY 77 commercial waste budget includes \$1.9 million in support of partitioning of high-level liquid waste.

Non-high-level Liquid Waste

This waste classification includes a wide variety of liquids as to chemical and radioactive content, frequently quite dilute. The basic requirement is for a means of concentration of the radioactive content prior to packaging. A number of treatments using relatively conventional technology are applicable, including evaporation, reverse osmosis, flocculation, precipitation, filtration, and ion exchange. ERDA's current interest here is to assess the relative benefits and optimize treatment selection, with particular emphasis on very high efficiency filtration to avoid the energy inputs required for evaporation of large volumes of water.

Where these wastes are not as dilute, several alternative technologies are in use to immobilize them by incorporation in absorbents, concrete, asphalt, or urea formaldehyde resin. Such immobilization methods may also be applied to solid residues from filtration or other treatment of non-high-level liquid wastes, or to wastes which are solid as generated, in order to minimize the risk of accidental dispersal of activity during further storage or transport. ERDA's program in this area will consist of promoting the demonstration of basic improvements and technology when these can contribute to improved systems of radioactive waste management beyond those commercially available.

The ERDA FY 1977 commercial waste budget includes \$2.9 million for processing of non-high-level liquid waste and related residues.

#### Combustible solid waste

Present treatment technologies available for combustible solid waste range from simple storage in boxes or steel drums to encapsulation in concrete. A volume reduction of five to ten fold can be obtained by available mechanical compaction methods. Further volume reduction together with a more stable product can be obtained with more advanced technology.

The FY 77 program provides for development of both thermal and chemical incineration processes for combustible wastes. This technology includes both the adaptation of existing incinerators to commercial waste and the development of totally new concepts.

The ERDA FY 77 commercial waste budget includes \$3.1 million for combustible solid waste.

#### Noncombustible Solid Waste

The major items in this category are failed and obsolete process equipment such as pumps, tanks, heat exchangers, piping, and gloveboxes.

In some cases these items present problems due to size or high levels of penetrating radiation. Air exhaust filters and inorganic ion exchange

resins are routine process sources of noncombustible waste. In addition to routine generation of these materials during plant life, major volumes of noncombustible waste may be expected at the time of plant decommissioning.

The ERDA R&D effort in this area is directed toward decreasing the final volume of these wastes and simplifying individual mechanical operations required for their treatment. Alternatives in the program include smelting and dissolving so as to convert the materials to consolidated form.

The FY 77 ERDA commercial waste budget allocates \$300,000 for handling this solid waste.

#### Gaseous Waste

The term "gaseous waste" is used here to include such gaseous or volatile radioactive materials as noble gases, iodine, tritium, and carbon-14.

The treatment technology is available to collect and retain noble gases and iodine and is being developed for tritium and carbon-14. The need for these technologies depends on the outcome of a pending EPA rulemaking procedure and the development work is thus supported on a contingency basis. ERDA testimony on the proposed regulations is available elsewhere.

Two technologies are being investigated to collect noble gas from offgas effluents -- a cryogenic process and one involving absorption in a liquid fluorocarbon. At present captured noble gases can be stored in pressurized gas cylinders. Development is underway on trapping noble gases in a solid matrix; this would mean that extended storage would not depend on the integrity of pressure vessels.

Iodine removal processes under study include caustic scrubbing, mercuric nitrate scrubbing, chemical absorption on zeolites, and several other more advanced processes.

The FY 77 commercial waste program includes \$1.0 million for gaseous and airborne wastes.

#### Decontamination and Decommissioning of Nuclear Facilities

At the time a nuclear facility is dismantled, wastes of many kinds are generated both from parts of the facility and materials used in the decontamination process which must be processed for disposal.

The ERDA R&D program in this field is directed at methods of volume reduction and decontamination to minimize waste volumes from decontamination of facilities, and to explore processes that offer promise of simplification in the management of resultant wastes.

The ERDA FY 77 commercial waste program includes \$790,000 for development of technology for wastes from decontamination and decommissioning operations.

#### Other Funding

The ERDA FY 77 commercial waste program includes \$2.0 million for environmental impact statements and for support of the National Academy of Sciences subcommittee related to the program.

#### SUMMARY

The ERDA FY 1977 commercial waste budget is keyed to providing input for decisions on reprocessing, waste forms and storage modes for high-level radioactive waste. The selection of specific sites and development of repositories for terminal storage is considered the major item in a greatly expanded ERDA Fiscal Year 1977 waste budget. For earlier necessary or desirable waste management activities, technology is either in use or considered well developed, i.e. the basic technical principles are clearly understood and data needed for design are available. Efforts to reduce these principles to practice, especially in high-level liquid waste solidification, are also the subject of expansion in the FY 1977 budget. All of the foregoing effort has been keyed to the expected needs of the nuclear fuel cycle industry.

Dr. KUHLMAN. Further, ERDA has scheduled during the week of July 11, an international symposium in Denver on radioactive waste. Much of the information in TAD will be summarized next week during that symposium. The first day of the symposium will be devoted to policy statements from key officials of various foreign governments and of the United States such as the Council on Environmental Quality, Environmental Protection Agency, Nuclear Regulatory Commission, Federal Energy Administration and ERDA. A subsequent public meeting dealing with other aspects—social, economic, and environmental, et cetera—or radioactive waste management sponsored by the Council on Environmental Quality, the National Science Foundation and ERDA will be held in the fall.

In addition to our domestic program, we are expanding our technical exchange programs with foreign countries to broaden the world base of information on geologic disposition of radioactive waste. Those involved in ERDA's domestic programs will participate in these international exchange programs. As an example of the international interest in radioactive waste management technology, one-third of the approximately 500 advanced registrations received to date for next week's international symposium are from foreign countries.

In the last part of my testimony, I would like to describe some specific steps we have already taken to increase the involvement of State agencies, Federal, and other organizations which will have a role in the eventual selection of permanent repositories for radioactive waste. The procedures are not complete, and they need to be tailored to the specific site and the State involved.

We have just reached a working understanding with the American Society of State Geologists in which the association will assist ERDA in the selection of study areas and later the pilot plantsites as well as contribute to the overall planning of ERDA's waste management program. ERDA will work with the State geologists in the study of each of the major formations. These deliberations will be available to the States.

In New Mexico, drilling explorations are underway for a possible site for isolating ERDA radioactive wastes. Like most States, New Mexico has quite a number of organizations which would be involved either directly or peripherally with a nuclear waste facility. The Governor of New Mexico has established a Governor's Technical Excellence Committee (GTEC), composed of leaders of the State's government, scientific and university communities, which advise the Governor on scientific and technical matters affecting the State. A subcommittee of the GTEC has been established to review and advise the committee on radioactive waste management activities in the State. We have worked closely with that subcommittee since the inception of our program in New Mexico.

In New Mexico, we have also established a Federal-State review group that is comprised of representatives of State agencies and regional Federal offices which held its first meeting on June 10, 1976. The first meeting was attended by about 25 organizations essentially equally split between State and Federal agencies. Representatives of the Governor participated in the selection of the State organizations

to be invited to the first review group meeting. This review group will hold meetings on a quarterly basis, and it is my understanding that the organizations were pleased that we initiated this effort very early in the evaluation phase of the program. The purpose of the group is to provide information to and promote interaction among all those State and Federal agencies whose responsibilities directly involve them with the project or indirectly require that they be aware of the possible impact of the project on their public activity. Many Federal-State activities today are complex and cannot be carried unilaterally. The establishment of such a review group would be offered to each State in which a serious investigation of a particular area was contemplated. The formation of the Federal-State agency review group is in no way expected to replace those individual group identified by the State as requiring a day-to-day working relationship.

We plan to publish during the study area phase, an environmental plan for the areas so that baseline environmental data can be collected well in advance of the pilot plant project if one is selected for the area. The plan will be issued for comment and the data identified in the plan will be collected by a number of organizations. We have had good experience using the universities within the State to accumulate some of the environmental data.

In conclusion, we believe that the Federal and State Governments, through the procedure which I have outlined and which will be developed, will be in the mutual position to determine from a safety standpoint the acceptability or unacceptability of deep geologic sites for the terminal storage of radioactive wastes. We feel that the selection of geologic formations and sites within these formations must proceed on an accelerated basis. This selection must be supported by scientific evidence with reviews by independent groups to assure us that no fact is overlooked in the use of geologic sites for permanent disposition of radioactive waste.

This ends my testimony.

Mr. CARR. Thank you very much, Dr. Kuhlman.

We recognize that it requires a little bit to put this thing together and we also recognize it has taken some traveltime for you and your colleagues to come out from Washington to be with us here in Alpena to help answer some of the difficult questions.

Let me ask the first one, which is really bottom line, will ERDA allow the State of Michigan to veto the use of Michigan as a site for any nuclear waste storage facility?

Dr. KUHLMAN. The ERDA program recognizes that a terminal storage facility in a State or within a community must be the product of complicated mutual interaction between the Federal Government and the State and local community. The program is structured so that during the development of the program, the safety of the site can be considered mutually by both parties and I would expect that the construction of a facility to be built would depend on the mutual conviction that the site was environmentally and physically safe.

Mr. CARR. Are you saying then that Michigan will have a veto over the selection of a Michigan terminal storage facility site?

Dr. KUHLMAN. A representative of the ERDA's office of General Counsel is present and I would like to have him answer that question.

Mr. CARR. Fine.

Mr. BROWN. Congressman, as a matter—

Mr. CARR. Could you identify yourself for the record?

Mr. BROWN. I am William L. Brown, attorney, Office of General Counsel of the Energy Research and Development Administration.

As a matter of technical point of the law—State and local government has no legal authority to regulate the Federal Government. This has been confirmed by many decisions from the Supreme Court and other Federal courts.

It is based on the Federal supremacy clause in the Constitution. However, we are not interested in standing on the technical aspects of the rights of the Federal Government. We are interested in cooperating with State and local government and, indeed, we intend to cooperate and we are interested in reaching mutual agreement with State officials with respect to health and safety aspects of selecting a site.

Mr. CARR. Well, let's talk about this word "mutual" agreement. To me that implies that unless the State agrees with you as a matter of policy, not as a matter of law, that you are going to accede to the State's wishes. And if the State merely says we don't want it, there is no mutuality. Is that correct?

Mr. BROWN. Yes, sir.

Mr. CARR. Doesn't that amount to a State veto?

Mr. BROWN. What we are not interested in is giving up Federal authority in this respect. We are interested as an act of comity to work with State government and, indeed, in order to reach mutual agreement, you have to have agreement of both parties. Yes, sir, we intend to operate on that basis.

Mr. CARR. Let me try it a little more because it sounds as though you are hedging a little bit there and I can understand your position.

Mr. BROWN. We are preserving the principle, Congressman.

Mr. CARR. It seems as though mutuality exists so long as the State essentially agrees with ERDA's position, whatever that may be. They may not want to come in here after it studies, but if that is the case, we are probably all wasting our time here today.

We are looking at the situation from the standpoint that ERDA will test, will go through its procedures, will carry out its responsibilities and it is given the right to see the right and then we are acting here today on the assumption that ERDA is going to decide that Alpena would be a really nice place to put one of these facilities.

The real question is if the people of Alpena, the people of the State legislature or any other areas of the State of Michigan or the Governor or our own scientific expertise in this State say as a matter of judgment even agreeing there are satisfactory efforts, it would be a relative risk, that as a matter of political judgment, wisdom, don't think we want it there in this State. No, thank you, we don't want to be the host State for this installation. Is ERDA going to abide by that or is ERDA going to hold out to the legal technicality or the legal right to impose a nuclear storage facility here in the State?

Mr. BROWN. Congressman—

Mr. CARR. You are reserving that, aren't you?

Mr. BROWN. We are reserving that. We are not giving up inherent Federal powers. What we are saying is we do want to cooperate with the State. We intend to cooperate with the State and if, indeed, in matters of health and safety—we cannot reach mutual agreement, then there would be not site in the State.

Dr. KUHLMAN. If I could add one thing to this—

Mr. CARR. Yes, sir.

Dr. KUHLMAN. When you take the discussion outside the realm of technical safety and environmental issues, I can't be responsive to you. However, within the realm in which the argument that could be carried on as a dialog on the scientific bases of whether something is safe, or whether something is environmentally sound, ERDA would make program additions or changes in order to reconcile with the State any serious differences in technical opinion.

There are many resources for this dialog and perhaps I did not convey to you clearly enough that the ERDA program is going to be predicated upon the use of third parties continually through the sequence of events leading to a repository which will be taking place over a period of years.

It is our intention to do everything within our power to arrive at a mutual understanding with all concerned parties on the safety of a repository. In a matter of technical, health, safety or environmental doubt, we don't want to go into the site.

Mr. CARR. Well, we take you as a—we know you are a fine representative of your agency and what I am seeking to do here for the people in the room and those who may learn of our hearing through reading our report or hearing it on the media, I am trying to clarify what the nature of this interaction is and who gets the final say.

Dr. KUHLMAN. Yes.

Mr. CARR. And again, correct me if I am wrong, it seems that the position of ERDA is to cooperate, to communicate with State officials and to engage in every accommodation that ERDA and the Federal Agencies feel they can make, but if in the final analysis ERDA really wants the site here and a mutual agreement cannot be reached, ERDA is prepared to press to have the site located here.

Mr. BROWN. Congressman, what—

Mr. CARR. You are reserving that right? I am not trying to say that you are going to do that, but you are reserving that right?

Mr. BROWN. Yes, sir, we are reserving the right.

Mr. CARR. I just want that clear so that we know that that is your position.

Let me turn now, Dr. Kuhlman, to a second topic. You have made a very fine statement. I think it is an informative statement. It tells us what we are talking about, so if we oppose or agree, we agree on things that we are knowledgeable of what we are agreeing or disagreeing about. Relative to the place we are citing right today, why Alpena?

That did not occur in your statement. You talked about the Salina formation, the map which you appended to your statement and the

explanation you gave of your map shows that it goes over about four States; the Salina formation spans Michigan, eastern half of Ohio, parts of West Virginia, and western, oh, about two-thirds of Pennsylvania, a little bit of New York State.

Are you drilling in other areas of that Salina formation? Are you anticipating a drill there?

Dr. KUHLMAN. I am going to ask Mr. Zerby to add to my answer since what I would be telling you on this subject would be hearsay.

I am quoting what I hear from our technical contractor. It is my understanding that the Salina basin as a whole is clearly an interesting foundation for our purposes. In looking at the basin and trying to narrow down smaller specific areas which should be studied in more detail as candidate areas, there is a need to understand the details of how the full basin is laid out.

In studying this information it is my understanding that there is a lack of data in this particular three-county area. More information is desired to understand the basin better.

This is the first hole that we have talked about drilling for additional geologic purposes. That is a true statement.

Now I would like to ask Mr. Zerby if he could add something more detailed to my answer.

Mr. ZERBY. Mr. Chairman, indeed the first hole was to be drilled in Alpena because it is an interesting area, and there is a dearth of information about it, in at least sufficient detail to characterize the formation as carefully as we would like to have it characterized.

It is our intent and our plan to go to other locations in the Salina formation in other States and carry out a coring program there to further characterize those portions of the basin in the other States. So this just happened to be the first hole in that whole sequence of general area studies.

Mr. CARR. I am sure most of us find the Alpena area interesting. Can you expand on that just a little bit? What is the interest? The fact you don't have data?

Mr. ZERBY. There is a large body of salt that resides below the surface and this is what makes it particularly interesting.

Since this salt body extends over a great region, there are other areas that are equally as interesting.

One has to start someplace. And we chose the three-county region as a study area to start from.

Mr. CARR. Mr. Ruppe.

Mr. RUPPE. If the chairman would yield.

Mr. CARR. I yield to the gentleman.

Mr. RUPPE. I understand the Salina formation extends from this area down through lower Michigan, Ohio and Pennsylvania. Now of all the millions of acres, I still don't quite understand why here?

Mr. ZERBY. We carried out a reconnaissance survey starting in 1972 in which all the known information about the known salt formation was documented and there were a number of areas that appeared interesting from the point of view of having a thick layer of salt residing below the surface at an interesting depth and that depth is several hundred feet below the surface of the ground and well below the biosphere.

Once these areas were identified, then our plan was to go into each of these areas and to perform field geologic studies. The Alpena-Montmorency-Presque Isle area was just one of these areas.

Mr. RUPPE. Now this several hundred feet of depth is not unique to this area, is it?

Mr. ZERBY. No.

Mr. RUPPE. Couldn't you have started under the Renaissance Center in Detroit or in Ohio or Pennsylvania?

Mr. ZERBY. It could have started—

Mr. RUPPE. It is curious because you write in your letter to me that the geologic information available on certain areas in Alpena, Montmorency and Presque Isle Counties was relatively sparse.

Mr. ZERBY. Yes.

Mr. RUPPE. Yet why wouldn't you have picked an area where you knew something about the terrain rather than picking an area you knew little about for your test boring?

Mr. ZERBY. The idea of this phase of the study is to build geological information and since there is a dearth of information in this particular area, we needed these boreholes to supplement that geologic information.

Mr. RUPPE. Was it done also because it is a rural area, what someone described this morning as a natural resource base? This is not written up in your report, but it was part of a statement given to us in Lansing.

To what extent did the remoteness, if you will, or rural character or lack of what might be called urban assets play in your decision to drill here first?

Mr. ZERBY. It had very little to do—

Mr. RUPPE. Well, it had something to do with it, didn't it?

Mr. ZERBY. No, except that one wouldn't want to go into center of a city and start drilling, of course.

Mr. RUPPE. Why not?

Mr. ZERBY. It is inconvenient from the point of view of locating equipment and drilling equipment there.

Mr. RUPPE. All right, but north of Detroit there about 200 miles of open space. Seriously now, there is a peculiarity in the fact that you took the furthest, most remote—if that is the right word—point to begin the test. It just seems to me that this indicates a desire to move into an area like this and leave untouched the more populous, more urbanized, more politically powerful perhaps, areas of the country.

Would you care to comment on that?

Dr. KUHLMAN. I am not going to try to add anything to what Mr. Zerby said about the lack of technical information.

Mr. RUPPE. Is technical information available in all other areas of the Salina basin except Montmorency County?

Dr. KUHLMAN. No, but I think, as Mr. Zerby said, you have to begin somewhere. The point I want to make, Congressman, is that the development of a more intimate dialog with the State government, with the State people, is a vehicle whereby I would hope that issues like these could be addressed. For example, the question of whether you should give emphasis to a rural area versus one that

is close to an urban population, is a decision that the State and local governments would help ERDA make.

Mr. RUPPE. Well, I would like to read, if I may, from *Nucleonics Weekly* of May 20, 1976, and I become a little perplexed at what appears to be on your part a modicum of interest in this area. In the headline—it is on page 8, of *Nucleonics Weekly*:

Union Carbide is moving into the final stages of its waste isolation site selection program, with the Salina basin in Michigan and the inland Gulf Coast domes leading the list. T. F. Lomenick of Union Carbide's Office of Waste Isolation, OWI, says that sites within the Salina basin, a three-county area in the northeastern portion of the southern Michigan Peninsula comprising Alpena, Montmorency, and Presque Isle Counties have been selected for a core drilling and geophysical survey program beginning next year.

Similar work is scheduled to begin within the next few months in the northern Louisiana salt dome basin. The Salina basin and the gulf coast salt dome sites are prime candidates for Union Carbide's first two waste isolation pilot plants, which it hopes to have on-line by mid-1985.

[The article referred to follows:]

[From *Nucleonics Weekly*, May 20, 1976]

Union Carbide is moving into the final stages of its waste isolation site selection program, with the Salina basin in Michigan and the inland Gulf Coast salt domes leading the list. T. F. Lomenick, manager of geology projects for Union Carbide's office of waste isolation (OWI), says that sites within the large Salina basin, a three-county area in the northeastern portion of the southern Michigan peninsula, comprising Alpena, Presque Isle and Montmorency Counties, have been selected for a core drilling and geophysical survey program beginning next year. Similar work is scheduled to begin within the next few months in the north Louisiana salt dome basin, and within fiscal 1977 in the northeast Texas and Mississippi salt dome basins. The Union Carbide program is running concurrently with the work being carried out directly by Erda in the Carlsbad region in New Mexico as part of the new Erda policy of locating multiple terminal storage sites.

The Salina basin and Gulf Coast salt dome sites are the prime candidates for Union Carbide's first two waste isolation pilot plants, which it hopes to have on line by mid-1985. Two other sites are still being considered as alternatives, however, the northeastern part of the Paradox basin in Utah and Colorado and a section of the Delaware sub-basin in the Oklahoma-Texas panhandle. Core drilling and geophysical surveys are planned in both regions during fiscal 1977. To meet the 1985 pilot plant completion date, a final decision on the first two sites needs to be made within the next two years, Union Carbide officials told industry representatives at a waste isolation conference held in Oak Ridge, Tenn., last week.

Current plans call for Union Carbide to locate two additional pilot plants by late 1987, and for these Lomenick says they hope to move away from rock salt deposits and into shale and mudstone or crystalline formations. The concept of terminal storage in crystalline rock is new, Lomenick says, and is based on preliminary observations that such formations may be free of circulating ground water below 3,000 feet. The next step in this will be studies carried out in cooperation with the Canadians over the next few months to determine what factors are inhibiting ground water flows. This research will be done in an area spanning Minnesota, Michigan and Wisconsin and reaching into Canada.

Experimental work with shale formations is already underway at a government-owned site in the Eleana formation in Nevada. Lomenick explains that the big factor under study here is whether impermeable excavations can be made over wide areas. The Eleana formation may prove too small for a full-scale storage site, sources say, but is a good test site for initial work with shales. Other potentially promising sites have been located in rock of this type in the Pierre shale formation in South Dakota, in the mid-continent formation surrounding the lower Great Lakes and in the Triassic basin along the eastern sea coast.

Test work on all these sites will be major budget items in the national waste terminal storage program for fiscal 1977. Union Carbide told potential contractors last week that up to 85% of this work will be let out to contractors and subcontractors, with most contracts to be awarded by October of this year. The total allotted for the program in the Administration budget was \$33.7-million, with Congress expected to add an additional \$14-million.

Mr. RUPPE. The fact that they say Union Carbide, your contractor, says there are prime candidates for two pilot plants which it hopes to have in production by mid-1985, appears to me you are doing a heck of a lot more than simply taking a few geological core samples out of this area.

Dr. KUHLMAN. Yes, sir.

Mr. RUPPE. But you just said a minute ago that you were not.

Dr. KUHLMAN. Let me clarify what I—

Mr. RUPPE. You can't have it both ways. You can't say you are moving to production tomorrow, but you just found the area today and you are doing very limited basic testing. The two stories just in my opinion don't—well, they require a lot more explanation. Let's put it that way.

Dr. KUHLMAN. It is true that the reconnaissance work done by the Union Carbide Co. have identified the Salina basin, the Salina basin and the gulf coast area as being the prime areas for the first two pilot plants. That is a true statement.

It is also true that there will be extensive investigation in both areas. Now, forgive me, Congressman, I am sorry if the article sounds like the "core drilling and geophysical survey programs" in this region equate to a determination to put the pilot plant in Alpena County. It is true that we do think that the Salina basin is important, but the contemplated drilling is an early step in a comprehensive program to locate a repository site.

Now, in August Mr. Zerby's organization will be doing several things which will affect a large number of States. The Office of Waste Isolation will be putting out contracts to do considerable additional work in the Salina basin and on the gulf coast as well as in other locations.

At that time there will be preliminary discussions with the individual States and then a comprehensive news conference is contemplated to describe the whole national program for fiscal year 1977.

Mr. RUPPE. You know, Mr Lomenick, the Union Carbide geologist, was apparently contacted by the Detroit Free Press on May 28 and advised that paper that they are looking at Alpena, and I would like to use his words, "because it is the most promising area," he says.

Dr. KUHLMAN. The Alpena area?

Mr. RUPPE. Yes, most promising. How can you say it is the most promising when 10 minutes ago you said you don't have the geological information here, we are testing around to fill in the gaps. I quote my own letter: "Geological information on certain areas in these counties is relatively sparse."

Yet you say it is sparse, but frankly you have also at the same time said it is the most promising area and apparently it would be within the Salina basin in spite of its limited geological information the prime candidate, have you not?

Dr. KUHLMAN. To my knowledge the Alpena—the decision has not been made where any repository will be located.

Mr. RUPPE. But is it the prime candidate?

Dr. KUHLMAN. The Salina basin is clearly a prime candidate. But whether the Alpena area is a prime candidate within the Salina basin—to my knowledge that judgment has not been made by the technical developers of the program.

Mr. RUPPE. That is not apparently what your contractor told the Free Press and I will be honest with you. I have supported in Congress nuclear power legislation. I do not have a record of blind opposition to nuclear power. What I am really concerned about is this: If you selected Alpena-Presque Isle-Montmorency for certain reasons as your disposal are and then are going to work backward through the process to step 1 with the goal in mind all along of picking this area, in which case the whole decisionmaking, the whole idea of consulting with people, the whole idea of an environmental impact statement is just baloney.

Dr. KUHLMAN. I agree if that were the case.

Mr. RUPPE. But you have selected the site already, the most specific site, the most promising and they indicate right here that as far as Union Carbide is concerned, this is going to be the place, decided already in their mind for, quote: "an isolation pilot plant."

Dr. KUHLMAN. I am sorry, Congressman. I really can't add anything further with respect to the Nucleonics Week article.

Mr. RUPPE. I will put it in the record if I have unanimous consent for that purpose.

Mr. CARR. Yes, indeed. The article has previously been included in the record.

Dr. Kuhlman, let me state, for the benefit of those in the audience today who are unfamiliar with Nucleonics Weekly, and bear me out if I am wrong, the committee subscribes to Nucleonics Weekly, which is a periodical which costs some \$400 a year for a subscription, as a source of information about what is going on in the nuclear industry.

This isn't U.S. News & World Report. It is a pretty reliable technical document, is it not?

Dr. KUHLMAN. I think that it—

Mr. CARR. Are you saying it might be in error?

Dr. KUHLMAN. I am not saying that—I was going to say that Nucleonics Weekly is a reputable reporter of the sources that it has. Yes.

Mr. CARR. I want to finish up my first questioning with a little review of the budget. You talked about it in your statement.

Dr. KUHLMAN. Yes, sir.

Mr. CARR. On page 9, you talk about how we are going to have \$4.6 million—is that obligational authority or is that—

Dr. KUHLMAN. That is obligational.

Mr. CARR. So we are all talking about apples and not apples and oranges. In fiscal year 1976, it is going to \$34 million—in fiscal year 1977. Can you push that out a little further and tell us what it is going to be right up to the first year of the first pilot plant?

Dr. KUHLMAN. Well, as you know, Congressman, the fiscal 1978 budget is still being worked over, but—

Mr. CARR. I am talking about the requests.

Dr. KUHLMAN. I will give you the ballpark numbers we are talking about internally.

Mr. CARR. Yes.

Dr. KUHLMAN. We are estimating this to be right about \$60 million a year for 1978 and 1979, and that should take you into the earliest year in which you would be talking about a capital project.

Mr. CARR. And as I look elsewhere in your statement, the capital projects are going to cost \$100 to \$200 million?

Dr. KUHLMAN. Yes.

Mr. CARR. What is the time of construction on those?

Dr. KUHLMAN. The construction is expected to take about 3 years.

Mr. CARR. I will just conclude, Dr. Kuhlman, by commenting on your statement here. On page 9, you state that it seems reasonable to conclude that this congressional budget action indicates support by Congress of the administration's program.

Lest I leave that totally naked in the record, I would want to say that that may indicate support by the committee, the legislative authorizing and appropriating committees with regard to your program, I think any student of American politics, and particularly the Congress, would be loath to construe an appropriation as an endorsement by the Congress as a whole of each and every program in that authorization or appropriation, particularly when it was not subject to any kind of an amendment to cut or to expand.

I wouldn't doubt that there is within the Congress support for the program. Let me hedge—I did say that was going to be my last shot, but I have one other item here.

In your letter to Congressman Ruppe, you said the final environmental impact statement will be submitted in the Joint Committee on Atomic Energy, that, in effect, the joint committee will decide whether funds shall be appropriated or authorized.

We hope that the environmental impact statement will also be submitted to this committee as a committee of oversight, so that we might be able to make our recommendations as well on your environmental impact statement.

Do you have anything else?

Mr. RUPPE. Thank you very much, Mr. Chairman. I would like to read for the record and for those present in this room a letter I have received from the Acting Chairman of the Council on Environmental Quality, or CEQ. For those of you who are not familiar with the Council on Environment Quality, they are essentially the environmental advisors to the President and they comment, review, and analyze all environmental impact statements that are developed by Federal agencies.

I would like to read for the record their letter to me of July 2 of this year:

DEAR MR. RUPPE: Thank you for your recent letter concerning the Energy Research and Development Administration's proposed test drilling project in the State of Michigan. I share your concern that ERDA take appropriate steps to assess environmental impacts before any test drilling is begun and keep the public fully informed of the Federal Government's plans for seeking a solution to radioactive waste management problems.

Since receiving your request our staff has been in contact with ERDA representatives concerning the proposed Michigan drilling project. Briefly, we established that, although ERDA's existing regulations for implementing the

National Environmental Policy Act provide for an environmental assessment to determine whether a full environmental impact statement will be written, no such assessment has been initiated.

Your inquiry thus was both timely and responsible for suspending drilling plans until an assessment is made. We recommend that ERDA adopt an approach which would apply not only to the problem at hand, but to future proposals of this nature.

We support the approach that was outlined in Mr. Baronowski's letter of June 22, 1976, to you. Briefly, ERDA will conduct a careful environmental assessment of the test drilling in Michigan and no drilling will be undertaken before this assessment is completed. When the assessment is completed, the decision will be made as to whether or not a full environmental impact statement is required.

The Council intends to review the assessment carefully. I wish to thank you and members of your staff for calling this matter to our attention.

I would like to ask you, quite frankly, why an environmental assessment was not done, since I understand from the CEQ letter that there is an internal directive within your organization that in such situations an environmental assessment be carried out?

Dr. KUHLMAN. In addition to the point you make, as I understand it, it is necessary to carry out such an assessment in order to get a drilling permit in the State of Michigan.

Mr. RUPPE. OK. Why didn't you—

Dr. KUHLMAN. The only point I am making is that it was intended that an environmental assessment would have been made before drilling took place. It is my understanding that the contractor would not be able to get a permit to drill in the State of Michigan without it.

It is the practice in ERDA to do environmental assessments for drilling. We have an extensive drilling program in the raw material program. In these, assessments are done after the contract is let to drill the hole or holes.

So my answer to you, sir, is that I expect that the assessment would have been done—

Mr. RUPPE. After the contract had been made?

Dr. KUHLMAN. After the contract had been let.

Mr. RUPPE. That is like closing the door after the horse has been let out of the barn, isn't it?

Dr. KUHLMAN. After the contract is let, it might introduce some embarrassing contractual situations if we could not, in fact, get an assessment approved or if a negative determination were made, yes.

Mr. RUPPE. Isn't it true that you had intended drilling in June?

Dr. KUHLMAN. The ERDA contractor had intended that the drilling take place in June. It is my understanding that the dialogs on this, however, have been going back, what, 1 month earlier?

Mr. ZERBY. Yes.

Dr. KUHLMAN. So, while we intended to do this in June, the situation has essentially been frozen since before June—since May. Mr. Zerby, would you like to add to that?

Mr. ZERBY. Yes. Our plan was to drill in June and this was predicated on the assumption that the environmental assessment would be filed as part of the request for permit to drill and on the assumption that that permit would be issued.

So it was a plan at that time to go ahead in June.

Mr. RUPPE. Do you know when the drilling contracts were made with the outside contractor?

Mr. ZERBY. They have not been made.

Mr. RUPPE. Then I think it is safe to assume that when I wrote you on May 27, I protested your action of moving ahead without an environmental assessment, yet had I not done so, apparently—and this is according to CEQ—you would have issued the contract, done the environmental assessment, and conducted the drilling, all within the next 33 days. That is pretty fast work.

Mr. ZERBY. Yes, indeed, it would.

Mr. RUPPE. And the environmental assessment wouldn't have been worth a heck of a lot, would it? Who is going to comment—you would have let the contracts, verified them within the agency, done the assessment, and completed the drilling, all within 33 days.

As I read this, the reason you stopped and the reason you are going to do that environmental assessment is I blew the whistle on you.

Mr. ZERBY. The assessment we are talking about is the one required by the State of Michigan in order to get a drilling permit. We felt that we could adhere to the rules of the State of Michigan in accomplishing the requirements of an environmental assessment.

Mr. RUPPE. What about your own internal procedures and your own internal policy of requiring an environmental assessment before the drilling takes place?

As I understand, CEQ says you have got it and you did not follow it in this instance, and I really would like to know why not?

Mr. ZERBY. Our plan was to file that assessment.

Mr. RUPPE. I will read the letter. I will have the GAO go back and work on this one, too.

"Your inquiry was both timely and responsible for suspending drilling until the assessment is made."

Do you have any comment?

Dr. KUHLMAN. Since my comment is only—it has to be hearsay; I am not sure of its value, but the staff of CEQ, with whom I have spoken to about this, knew of our geologic work. They had the impression that we had already let a contract and we were, in fact, drilling but they had been informed to the contrary.

Now, I have no idea whether the staff to whom I talked has any direct contact with the man who wrote you that letter.

Mr. RUPPE. The man who wrote it is John Busterud, the Acting Chairman of CEQ. He should have some knowledge.

Dr. KUHLMAN. I am sorry, Congressman. I cannot go any further in this area. We have, to the best of our knowledge, explained what happened.

Mr. RUPPE. CEQ indicated here you have an internal requirement that an environmental assessment be made before a program like this is initiated and, in this instance, you did not adhere to your own internal requirements.

You mentioned, on page 3 in your statement, that: "Emplacement of waste in deep geological structures provides a terminal storage method which combines safety with a very minimum requirement for human surveillance."

As I also recall from your testimony, the radioactivity of plutonium and its dangerous characteristics last about 25,000 years. How can you both bury it and forget it, or forget it with a minimal amount of human surveillance?

Isn't a great deal more surveillance than that required for such an installation?

Dr. KUHLMAN. The past programs for handling this waste involved the location of the waste on engineered facilities on the surface of the land. That concept was withdrawn and the geologic concept was substituted.

The basis for the statement you question is based upon the best of alternatives. This particular option of geological emplacement has been looked at by a variety of groups, the most prominent of which, of course, has been the National Academy of Sciences.

Mr. RUPPE. You also stated that construction and operation of such repositories is well within present state of the art methods. Yet I do believe you indicated in the next sentence that the level of work has been, and I quote, "modest."

Why, sir, are you spending some \$40 million in research next year, up from about \$6 million a year ago, for something that is, within your viewpoint, within the present state of the art?

Dr. KUHLMAN. Because the work done up to now has been the development of—conducting the research and the development of an ability and know-how to do a job. The basis of this investigation now leads us into the phase of this program where now we are, in fact, going to find locations and actually to do the construction, which I think classically is always a much more expensive phase of any engineering development program.

Mr. RUPPE. During the April 29, 1975, hearings before the Subcommittee on Energy and the Environment, Dr. Pittman, Director of the Division of Waste Management and Transport of ERDA, testified that salt beds in New Mexico were sufficient to "hold everything that we generate between now and into the next century in one single shaft." This was for 1,000 reactors.

If this is true, then why is ERDA spending its time and its resources looking into relatively high-population regions such as the State of Michigan?

Dr. KUHLMAN. I think the answer to your question—it has at least three parts to it. First, as was pointed out before, the finding of a repository for waste is long overdue in this country. There have been several false starts.

It is the judgment of ERDA that this has to be avoided again so that the plan involves simultaneous development of several options, involving several repository sites, so that if something unexpected happens with one, the program does not lose momentum, that you will, in fact we will have a repository in the mid-1980's.

The second part of the answer is that there is attraction for geographic distribution for repositories, again both for economic and safety reasons, by shortening of transportation links. Also, quite frankly, Congressman, we think that the individual States would find it much more appropriate if no one State is asked to bear the full burden of waste disposal for the entire country.

Mr. RUPPE. I read here from a report prepared by the Congressional Research Service and it says:

As of June 20, 1975, approximately 80 million gallons of liquid high-level wastes were being stored at three sites in about 200 stainless steel or carbon steel tanks of various capacities. The life expectancy of the tanks is more than 50 years. However, because of the high-level radiation, and thermal, and

mechanical failures in the tanks, at the Hanford Reservation, alone, over 423,500 gallons of high-level wastes have leaked from 16 tanks. The largest leak occurred June 8, 1973, when tank 106T leaked a total of 115,000 gallons, amounting to 54,000 curies of radioactivity.

Savannah River facility has recorded at least one serious leak, but NRTS in Idaho has recorded none.

I only bring that up because it seems to me that the state of the art has a long way to go, and I would question whether we are as far along perhaps as you suggested in your earlier testimony.

Dr. KUHLMAN. If the tanks that have leaked are tanks that have been in existence from the beginning of the nuclear energy program, from the weapons program, that would date from in the 1940's.

New tank designs were instituted in about 1960. These are new tank designs, double wall tanks representing, if you will, the building on the lesson of the past.

There has been not a single evidence of a leak from any of the modern design tanks.

Mr. RUPPE. Well, I have taken enough time and I would, if I had more time on another occasion, go into your experience in Kansas but just let me say that I think the work has to be done but I would say there is an awful lot of work left to go. In conclusion, I would certainly anticipate that ERDA has made no decision to first locate their disposal site here and then work backwards through the decisionmaking process to step one.

I would like to think that ERDA is working from step one forward.

I would think it would be a great disservice and outrage to the people of this area if indeed a decision is made simply because this is a remote or rural or less populated area to select this area as a disposal site and then develop the administration procedures to conform to that decision.

Thank you, Mr. Chairman.

Mr. CARR. Dr. Kuhlman, we thank you. I think if there is any message you can take back to ERDA with you, it is that the beginnings of your waste disposal and investigations in the State of Michigan got off to a very shaky start and if public confidence in what you do in this State is to be strengthened, the kinds of communications which you may have had in New Mexico could but did not get going here in the State of Michigan early enough to be strengthened; and that the citizens of Michigan are very serious about their environment and serious about their trusteeship for the land on which we are privileged to occupy for the time which we are alive.

And the ERDA, the Administration is asking us to make some decisions about the next 24,000 years, perhaps 240,000 years. We take that very seriously here in Michigan and we want to participate precluded from becoming the major industrial urban centers in the in that. We want to make sure that regions like Alpena are not ever years 3000 or 4000 or the year 5000 or if we are still around here in our civilization in the year 10,000. We do not want to foreclose things we cannot even foresee. The citizens of our State take trusteeship of their national resources very, very seriously.

We are grateful that you came here today and shared your point of view and the point of view of the administration with us. We

are grateful for your colleagues joining you, too, and we mark this as the beginning of a dialogue. Thank you very much.

Dr. KUHLMAN. Thank you, sir.

Mr. CARR. Earlier, we had had a request for time by Mr. James Trucken, who was to represent the director of the Michigan Department of Natural Resources. We have not received word that he is here. Is he here?

Mr. Trucken, would you care to be our next witness then, please.

#### STATEMENT OF JAMES TRUCKEN, REPRESENTING DIRECTOR OF MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Mr. TRUCKEN. Is that an offer?

Mr. CARR. I am sorry, I did not know that you were in the room.

Mr. TRUCKEN. That is quite all right. Thank you, Mr. Chairman and members of the committee. This afternoon I have a very brief statement that I would like to present on behalf of the director of the Department of Natural Resources.

Basically, it sets forth the department's position in this matter. I would like to read you a letter which expressly elucidates this position which we sent to the director, Clay Zerby, one of the previous witnesses, director of the office of waste isolation, nuclear division, the Union Carbide Corp., Oakridge, Tenn. The letter is dated June 3, 1976.

Dear Mr. Zerby; following a recent meeting between members of my department and ERDA personnel regarding preliminary testing and future development of a nuclear waste storage site in Michigan, I received a letter from William Milliken, Governor of Michigan. In his letter the Governor directed me to obtain certain commitments from your agency before further actions are taken regarding possible nuclear storage sites in Michigan.

Specifically, the Governor stated and I quote, "I feel that before any further negotiations, discussions, and/or binding decisions or contracts are made, I, as Governor of this State, must be assured in writing that a disposal site would not be determined in Michigan without approval of the State."

The Governor's decision is clear. I have instructed my staff to terminate all discussions with, to study the feasibility of nuclear wastes in Michigan until we receive further direction from the Governor.

The letter goes on and is signed by Howard Tanner, director of the department of natural resources.

[Complete letter referred to follows:]

MICHIGAN DEPARTMENT OF NATURAL RESOURCES,  
Lansing, Mich., June 3, 1976.

Mr. CLAY ZERBY,

Director, Office of Waste Isolation, Nuclear Division, Union Carbide Corp.  
Oak Ridge, Tenn.

DEAR MR. ZERBY: Following a recent meeting between members of my department and ERDA personnel regarding a preliminary testing and future development of a nuclear waste storage site in Michigan, I received a letter from William G. Milliken, Governor of Michigan.

In his letter, the Governor directed me to obtain certain commitments from your agency before further actions are taken regarding possible nuclear storage sites in Michigan. Specifically, the Governor stated, "I feel that before any further negotiations, discussions, and/or binding decisions or contracts are made, I, as Governor of this State, must be assured in writing, that a disposal site would not be determined in Michigan without approval of the State."

The Governor's decision is clear. I have instructed my staff to terminate all discussions related to ERDA's proposals to study the feasibility of storing nuclear waste in Michigan until we receive further direction from the Governor.

I have enclosed a copy of the Governor's letter to me for your information. I would be happy to serve as contact with our Governor's office on this matter, or you may contact him directly at your discretion.

Sincerely,

HOWARD A. TANNER,  
*Director.*

STATE OF MICHIGAN,  
OFFICE OF THE GOVERNOR,  
*Lansing, Mich., May 26, 1976.*

Dr. HOWARD A. TANNER,  
*Director, Department of Natural Resources, Stevens T. Mason Building,  
Lansing, Mich.*

DEAR HOWARD: I appreciate the fact that you included a member of my staff in the meeting which took place yesterday in your office with representatives of ERDA and other members of your staff.

I think it is most important that we have these preliminary discussions before any commitments are made regarding this very critical problem. While I recognize the situation we face nationally regarding nuclear waste, I feel strongly that information regarding preliminary testing and future development of a proposed area must be made available to everyone concerned. This includes the local citizenry and governmental units.

I want to reiterate my belief that complete openness must prevail for proposals such as the one discussed Tuesday regarding a preliminary geological study of possible sites in three counties of northeastern Michigan for nuclear waste products. I feel that before any further negotiations, discussions and/or binding decisions or contracts are made, I, as Governor of this State, must be assured, in writing, that a disposal site would not be determined in Michigan without approval of the State. It is crucial, I feel, that the facts based on the scientifically gathered information and local citizen and governmental input regarding this project will be important in the final decisionmaking process. I feel that this must be resolved initially and at once.

I understand ERDA wishes to begin geological study about mid-June. I think that before any contract is signed between ERDA and local contractors, they should be fully aware of my position in this matter.

If the above can be resolved, then it is most important that proper lines of contact are determined between ERDA and the State of Michigan which guarantees openness of operations. I feel that the Michigan Environmental Review Board must actively participate in any and all plans regarding this project.

As you know, I will name my Task Force on Nuclear Waste Disposal in the near future. The task force's first assignment from me will be to focus on this immediate proposal. I would ask that all parties work closely with this group.

Regardless of the ERDA timetable, this proposed project cannot be rushed without the proper agreements between all State agencies involved, ERDA and most important public concerns and input.

I would appreciate your relating these comments to the proper ERDA personnel.

Warm personal regards.

Sincerely,

WILLIAM G. MILLIKEN,  
*Governor.*

Mr. CARR. If I may interrupt, would you speak up just a little more. I am sure some of the people in the back of the room are not picking you up.

Mr. TRUCKEN. All right, fine.

Basically, that is the position that the director wanted me to convey to the committee this afternoon. One further point that he wished me to discuss with the committee and that was the matter of secrecy.

In your announcement of this oversight hearing, you indicated there was some secret meetings going on between ERDA officials and the Michigan Department of Natural Resources. The director would like to assure you that no secret meetings have taken place. In fact, the earliest formal decisions we had with ERDA officials took place in March of this year at which time a formal news release was issued subsequent to that meeting.

The next meeting that we had with ERDA people took place in May of this year and again that precipitated the inquiries that you are presently a part of as far as the drilling of the test hole goes.

That is basically what the Director would want me to convey to you this afternoon.

Mr. CARR. Thank you, Mr. Trucken.

We appreciate the position of Dr. Howard Tanner, our friend and who is the head of the Department of Natural Resources in the State of Michigan.

It would appear from the statement of the previous witness and his counsel that there is an impending dilemma about the negotiations between DNR and ERDA.

Mr. TRUCKEN. Yes, it would appear there are some problems that would have to be worked out. There are going to have be some discussions along those lines.

Mr. CARR. We would appreciate it, to avoid any further feelings that someone is not informing someone else, that this subcommittee ing informed of how you proceed with those relationships, those in its oversight functions as to nuclear policy would appreciate be-communications particularly with regard to the question of whether Michigan would have a right of veto.

I yield to my colleague.

Mr. RUPPE. Thank you, Mr. Chairman.

You indicated then that the meetings started in March?

Mr. TRUCKEN. That is correct.

Mr. RUPPE. There is some confusion because the letter I received from ERDA states and I quote on page 2, "commencing with last November, representatives of our Oak Ridge operations Office and their contractors and consultants met with officials of Michigan's geological survey, part of the DNR. Additional meetings were held with these and other DNR officials in March and May of this year."

Mr. TRUCKEN. Could I indicate, the early meetings as I understand it took place with the geological division personnel and the first formal meeting we had with them was in March of this year. That was with the Director's office.

Mr. RUPPE. In other words, the note means they started—

Mr. TRUCKEN. Informal negotiations may have started earlier.

Mr. RUPPE. But the contacts started in November 1975.

Mr. TRUCKEN. If that is what your letter indicates, that could be. I have no knowledge of that.

Mr. RUPPE. There was a reference made by ERDA a little while ago to a DNR, I believe, requirement for an environmental assessment. What actually would be—what kind of an assessment would be conducted or developed with respect to a test drilling program?

Mr. TRUCKEN. Well, at the April 25 meeting, when ERDA came in with their proposal for a drilling permit, we indicated to them that an environmental assessment should be conducted on this project, since it was of a controversial nature. The Governor of the State of Michigan has executive guidelines which set forth the types of projects and the data requirements for projects that would be controversial, such as this type.

Mr. RUPPE. When was that done—if the Governor's letter and my comment had not been raised, when would that assessment have been completed, since apparently it was not contemplated as of May 27?

Mr. TRUCKEN. I was not—

Mr. RUPPE. Or was it going to be prepared?

Mr. TRUCKEN. We indicated to ERDA that one would be required. Since that meeting—that was in May of—May 25—we received a letter from the Governor on May 27 which indicated that we were to have no further negotiations.

Mr. RUPPE. What kind of environmental assessment was that? Would that be done by the contractor, ERDA or DNR?

Mr. TRUCKEN. It is generally done by the person proposing the project to the Department. The Department reviews the project and the project proposer for additional data and will then review that additional information and if the document is adequate, it becomes if there are shortcomings or inadequacies, the Department will ask what we call a departmental environmental impact statement.

Mr. RUPPE. Do you think that an environmental analysis and your perusal and review of the statement could all have been completed between May 27 and the end of June?

Mr. TRUCKEN. I have no idea whether it—

Mr. RUPPE. Seriously, it is not very logical; is it?

Mr. TRUCKEN. Not unless they had an awful lot of data.

Mr. RUPPE. Which brings me back to what CEQ wrote which is, frankly, ERDA did not intend to write the environmental assessment and were not going to do so until the Governor's letter and my comment was received by them.

Mr. TRUCKEN. That would be—

Mr. RUPPE. I think it is safe to say it could not all have been done within 33 days.

Mr. TRUCKEN. Yes.

Mr. RUPPE. I thank you.

Mr. CARR. Thank you very much for your testimony and your presenting the statement of Dr. Howard Tanner.

At this time, we are going to hear from three county commissioners, one from Alpena, Mr. Dale Huggler; Mr. George McCreery from Presque Isle County Board of Commissioners; and Mr. Clifford Tucker of the Montmorency County board. Are any of these gentlemen here?

[No response.]

Mr. CARR. Mr. C. Merritt Clark, is he in the room?

Are you, sir, representing or substituting for them?

Mr. CLARK. Yes, sir.

Mr. McCREERY. And I am George McCreery.

Mr. CARR. Would you want to make a presentation?  
Mr. McCREERY. Right.

**STATEMENTS OF GEORGE McCREERY, PRESQUE ISLE COUNTY BOARD OF COMMISSIONERS, AND C. MERRITT CLARK, MONTMORENCY COUNTY BOARD OF COMMISSIONERS**

Mr. CLARK. I am C. Merritt Clark, county commissioner, Montmorency County. Thank you kindly, Mr. Chairman. You have in front of you a copy of our resolution dated June 18, 1976, and also immediately following that our statement which I would like to read at this time.

The general contention of the Montmorency County board members in discussion prior to enacting the resolution disfavoring your proposal was:

We live in this environment because we so chose, and we are not quick to accept change about things of which we have meager knowledge, in this case, nuclear waste.

It is my belief that generally people in our area would need much more information about the contaminant and/or safe deposit as you propose before ever agreeing to such deposit in northern Michigan.

We are aware of our present environment here, and most of us have visited other areas where we find different environment distasteful.

We believe that the burden of proof lies with you to prove that it is safe and not with us to prove it unsafe.

Are we going to lose more than we are going to gain?

Off the record, am I allowed to say something more than this?

Mr. CARR. You are allowed to express yourself in any way you see fit.

Mr. CLARK. Let me say this, I would like to thank this committee for allowing us to be heard and to calm and difficulties that you have to do this. But I would like to say that I am a little disappointed and this concerns some the information I have received here or heard this afternoon; I think it has been a long time since I have heard such evasive use of the English language when all we needed was a yes or no and I believe that I heard an attorney talk here a moment ago and I am sure he's probably instructed witnesses in court that all he would like from the witness was a yes or no answer and that is exactly what we want here.

I think that is what we would understand.

But I did not hear this.

Mr. CARR. I think you got a "maybe," Mr. Clark.

Mr. CLARK. Did I?

Mr. CARR. I think that is all you can count on.

Mr. CLARK. I think that is very "maybe", too.

Mr. CARR. Without objection, I would like to include in our record your resolution number three.

Mr. CLARK. Thank you.

Mr. CARR. Without objection, so ordered.

[Resolution referred to follows.]

C. Merritt Clark

RESOLUTION # 3

At a meeting of the Montmorency County Board of Commissioners, held in Atlanta, Michigan on the 18th day of June 1976, On a motion made by, C. Merritt Clark and seconded by, Carl Fischer the following action was taken, and

WHEREAS, Montmorency County Board of Commissioners feel that the State and Federal Government have introduced and passed legislature to clean up our communities and,

WHEREAS, there has been a steady flow of anti-polution laws as well as pressure on Counties and Townships to enforce Zoning, Building Codes, and Solid Waste Plans, all of which has placed somewhat of a financial burden on the smaller Townships and Counties and,

WHEREAS, the Board feel that dumping of unnatural materials in Northern Michigan would affect our woods and streams and be a detriment to our environment in direct conflict to our laws.

THEREFORE, BE IT RESOLVED that the Montmorency County Board of Commissioners do hereby go on record as being apposed to the dumping of nucular radioactive waste in Northern Michigan.

Present: C. Merritt Clark  
Carl Fischer  
Carl De Lou  
Clifford Fischer  
Dorothy Westcott

Absent: None

I, Florence M. Dann, Count Clerk, Montmorency County do hereby certify this is a true copy of the resolution passed by the Montmorency County Board of Commissioners.

Florence M. Dann  
Florence M. Dann

(2)

General contention of Montmorency County Board Members in discussion prior to enacting the resolution disfavoring your proposal was:

We live in this environment because we so chose, and we are not quick to accept change about things of which we have meager knowledge, in this case, nuclear waste.

It is my belief that generally people in our area would need much more information about the contaminant and/or safe deposit as you propose before ever agreeing to such deposit in Northern Michigan.

We are aware of our present environment here, and most of us have visited other areas where we find different environment distasteful.

We believe that the burden of proof lies with you to prove that it is safe and not with us to prove it unsafe.

Are we going to lose more than we are going to gain?

①

Mr. CARR. I would like to clarify a matter of your statement. You refer to "you" in your statement. Are you referring to the committee or are you referring, to whom are you referring?

Mr. CLARK. "To whom it might concern." [Laughter.]

Mr. CARR. OK. I feel obligated to get this committee off the hook. You understand that.

Mr. CLARK. Thank you.

Mr. CARR. I thank you.

Mr. McCreery, are you prepared to proceed?

Mr. McCREERY. Thank you, Mr. Chairman. We passed in Presque Isle County the resolution that you have and I have a statement here.

Gentlemen, as chairman of the board of the Presque Isle County Board of Commissioners, I would like to present the views of the residents of the county which I represent regarding the nuclear waste disposal site.

We are very much opposed to the Federal Government selecting our area as a possible site because of the following reasons:

The structure beneath Presque Isle County is very honey-combed with many caverns. Many drillers strike these "faults of the earth" when drilling and lose their rigs.

Whole lakes have gone dry and then have later reappeared. Logs, in the lumbering days, disappeared and later were found in other lakes, many miles away.

We are so close to Lake Huron and other Great Lakes that the risk to damaging the waters and hurting our Canadian neighbors is too great to allow the dumping of nuclear waste in northeastern Michigan.

I have interviewed many drillers in water and oil drillings in Presque Isle County and where they think and know things are, according to seismograph tests, and all other latest equipment used to determine what is beneath the surface of the earth, and yet they do not know exactly what is there.

Therefore, something underneath the crust of the earth is throwing things off. This has been a big problem and it really has the geologists stumped. They know, by the formation of rocks and drilling tests certain things should be there, but are not. Everything they find in drilling points to the facts it should be there, but is not.

Therefore, in conclusion, the Board of Commissioners of Presque Isle County would like to go on record as opposing this proposition of the Federal Government in using our area as their dumping grounds with this following resolution adopted by the commissioners at our last regular session.

Thank you.

Mr. CARR. Without objection, the resolution will be entered into the record as will the text of your full letter.

[Information referred to follows:]

Committee on Interior and Insular Affairs  
U. S. House of Representatives  
Washington, D.C.

Gentlemen:

As Chairman of the Board of the the Presque Isle County Board of Commissioners, I would like to present the views of the residents of the county which I represent regarding the Nuclear Waste Disposal Site.

We are very much opposed to the Federal Government selecting our area as a possible site because of the following reasons:

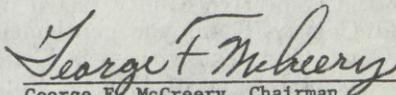
The structure beneath Presque Isle County is very honey-combed with many caverns. Many drillers strike these "faults of the earth" when drilling and lose their rigs.

Whole lakes have gone dry and then have later re-appeared. Logs, in the lumbering days, disappeared and later were found in other lakes, many miles away.

We are so close to Lake Huron and other Great Lakes that the risk to damaging the waters and hurting our Canadian neighbors is too great to allow the dumping of nuclear waste in Northeastern Michigan.

I have interviewed many drillers in water and oil drilling in Presque Isle County and where they think and know things are, according to seismograph tests, and all other latest equipment used to determine what is beneath the surface of the earth, and yet they don't know exactly what is there. Therefore something underneath the crust of the earth is throwing things off. This has been a big problem and it really has the geologists stumped. They know, by the formation of rocks and drilling tests certain things should be there, but aren't. Everything they find in drilling points to the facts it should be there, but isn't.

Therefore, in conclusion, the Board of Commissioners of Presque Isle County would like to go on record as opposing this proposition of the Federal Government in using our area as their dumping grounds with this following resolution adopted by the Commissioners at our last regular session.



George F. McCreery, Chairman  
Board of Commissioners  
Presque Isle County, Michigan

Mr. CARR. You mentioned in your statement the subterranean caverns.

Is this a well known geological fact in Presque Isle County?

Mr. McCREERY. Yes, we have a string of sinkholes. He also have underground waters, but kids play in whatever is there, they play in them and this is just the surface, but I imagine underneath there is a lot more going on. I personally have lived here all my life, and from my dad I have heard him tell of the logs that disappeared and reappeared 30 miles away in a bigger lake. Yet, the lake came back. There is water in it today and since that time it has gone dry a couple of times but yet it always comes back.

Mr. CARR. I yield to my colleague, Mr. Ruppe of the 11th district.

Mr. RUPPE. Thank you very much, Mr. Chairman.

Is there much drilling for oil done in this particular Montmorency County area?

Mr. McCREERY. Well, in Presque Isle County—

Mr. RUPPE. Excuse me, Presque Isle County, yes.

Mr. McCREERY. They just cannot find it. I talked to people that get signs and they know where the oil is but it is not there when they get there.

Mr. RUPPE. They have drilled for it but they have not been successful in carrying that out?

Mr. McCREERY. They just cannot find it. I talked to people that have been in the oil bits all their life and they are fellows 60 years old and they just cannot center it down.

Mr. RUPPE. Is there any quarrying done in that area?

Mr. McCREERY. Yes, lots of quarrying. We have the larger limestone quarry in the world.

Mr. RUPPE. How deep does that go?

Mr. McCREERY. It is not deep, it is surface, open. We have one also at just this side of Alpena, a rock quarry. We are shipping out Presque Isle in rock form.

Mr. RUPPE. Slowly, though.

Mr. McCREERY. Seventeen long million tons a year. That is not very slow. It is coming awful fast.

Mr. CARR. Thank you, Mr. McCreery, for taking your time and to Mr. Clark for taking time to be with us and give us the expression of the respective county board of supervisors.

Mr. McCREERY. Thank you, gentlemen.

Mr. CARR. Our next witness is Ms. Mary Ann Coggins, president of the Alpena League of Women Voters.

Mr. TITUS. Mr. Chairman, I have been asked to speak for Mr. Huggler and he asked me to make a statement in his behalf.

Mr. CARR. Fine.

**STATEMENT OF KEITH TITUS, COUNTY COMMISSIONER, MAPLE RIDGE TOWNSHIP IN ALPENA, AND PRESIDENT OF THE NORTH-EAST MICHIGAN COUNCIL OF GOVERNMENTS**

Mr. TITUS. I am not sure he knew what he was getting himself into. I am Kieth Titus, County Commissioner from Maple Ridge Township in Alpena County and I am president of Northeast Michigan Council of Governments.

I repeat that my statement may seem both, or either impolitic or impolite but many of the previous statements have been politic and polite enough to more than balance, I think.

My statement may even be considered inflammatory but I feel it is a more valid assessment of the way the population feels about this proposed dumping.

I wish to make a statement today in two parts, one, which I consider to be a realistic appraisal of the question; and the second, an emotional reaction to that question.

First, the reality of our situation is this; there exists today plants which create power through the process of nuclear fission. Thus far, and as far into the future as we can presently see, this results in a waste product containing the most deadly substance known to man. This waste produce must be disposed of. It must be disposed of in such a manner that humankind can be assured forever that this deadly poison will never be unleashed.

Thus far and as far into the future as we can presently foresee, such a guarantee of safety cannot be made by anyone.

It remains then that the safest possible disposal must be made. It must be made in such a way that wherever it is stored, it can be retrieved easily when and if a failsafe method of disposal is discovered.

Until such time as such a disposal method is available, no further nuclear powerplants should be constructed, and those plants which already exist should be disarmed at the earliest possible moment.

I think it can be safely assumed that nowhere in this country will citizenry readily agree to disposal of such frightening substances in their backyards. Therefore, the real issue must become not whether the population wants it but whether this is the best place. This is the reality of the situation as I perceive it but I must also react emotionally and that emotional reaction, I believe to be as real as my logical reaction.

So second, emotionally—there will be no nuclear waste disposal in northeastern Michigan. I say this absolutely and unequivocally. Neither myself nor my children nor my neighbors and their children will allow their government to do this.

The risks are too great. Indeed, the risk is the ultimate risk of mass Russian roulette. Let us not be deluded. In reality, at this point nuclear waste technology is only a hair removed from the chanting mumble-jumble of witch doctors. We are a strange and stubborn people up here, a mixture of dirt farmers and cosmopolitans of sophisticated worldliness and common sense simplicity, of reasonableness and emotional irrationality. But when the beast in us is aroused—and I assure that it is—the jack pine savage is a ferocious animal. And I say again, despite hearings, conferences, and volumes of bureaucratic impact statements, we will not allow placement of this waste disposal facility here.

At the risk of sounding simplistic, we are the government, and we are smart enough to know that the ultimate absurdity for humankind is to choke to death on the effluent from our irradiated anus.

Attached to this statement is a resolution passed by the Alpena

Board of Commissioners at the official June board meeting opposing the disposal of nuclear wastes in Alpena County.

Thank you.

Mr. CARR. Without objection, the resolution will be included in full in the record.

[Information referred to follows:]

PREPARED STATEMENT OF KEITH TITUS, COUNTY COMMISSIONER, ALPENA COUNTY, JULY 6, 1976

My name is Keith Titus. I am a county commissioner from Maple Ridge Township and Alpena Township in Alpena County. I am the president of North East Michigan Council of Governments.

I wish to make this statement today in two parts; one which I consider to be a realistic appraisal of this question and a second, an emotional reaction to the question.

First; the reality of our situation is this; there exists today plants which create power through the process of nuclear fission. Thus far, and as far into the future as we can presently see, this results in a waste product containing the most deadly substance known to man. This waste product must be disposed. It must be disposed in such a manner that humankind can be assured—forever—that this deadly poison will never be unleashed. Thus far, and as far into the future as we can presently see, such a guarantee of safety cannot be made.

It remains then, that the safest possible disposal must be made. It must be made in such a way that wherever it is stored it can be retrieved easily, when and if a fail-safe method of disposal is discovered. Until such time as such a disposal method is available, no further nuclear power plants should be constructed, and those plants which already exist should be disarmed at the earliest possible moment.

I think it can be safely assumed that nowhere in this country will citizenry readily agree to the disposal of such frightening materials in their back yards. Therefore the real issue must become, not whether the population wants it, but whether this is the best place. This is the reality of the situation as I perceive it—but I must also react emotionally, and that emotional reaction I believe to be as real as my logical reaction.

So, second, there will be no nuclear waste disposal in northeastern Michigan. I say this absolutely and unequivocally. Neither myself, nor my children, nor my neighbors and their children, will allow their Government to do this. The risks are too great—indeed the risk is the ultimate risk of mass Russian roulette. Let us not be deluded in reality at this point, nuclear waste technology is only a hair removed from the chanting mumbo-jumbo of witch doctors. We are a strange and stubborn people up here, a mixture of dirt farmer and cosmopolitan, of sophisticated worldliness and common sense simplicity, reasonableness and emotional irrationality. But when the beast in us is aroused—and I assure you it is—the jack pine savage is a ferocious animal, and I say again, despite hearings, conferences, and volumes of bureaucratic impact statements—we will not allow.

At the risk of sounding simplistic, we are the government and we are smart enough to know that the ultimate absurdity for humankind is to choke to death on the effluent from our own irradiated anus.

Attached to this statement is a resolution passed unanimously by the Alpena Board of Commissioners at the official June board meeting, opposing the disposal of nuclear waste in Alpena County.

## RESOLUTION

RE: NUCLEAR DUMP SITE

- WHEREAS, the Federal Government of the United States has announced its commitment towards the consideration of a nuclear waste disposal site within Northern Michigan at Alpena; and
- WHEREAS, the proposed exploratory bore drillings within the County of Alpena by the Energy Research and Development Administration have been scheduled and announced without either the consideration, consultation, or concern of the Citizens of Alpena County, their elected local officials or the government of the State of Michigan; and,
- WHEREAS, Federal authorities have said neither local units of government nor the government of the State of Michigan will be given control or veto power over the location of the highly radioactive nuclear waste burial site; and,
- WHEREAS, Federal bureaucrats and officials have not favorably reacted to a proposal by Congressman Philip E. Ruppe for an environmental study before authorized drillings begin or a proposal by Governor William G. Milliken asking for full, public hearings on any waste disposal plan and an ultimate state veto on any such plan or site; and,
- WHEREAS, the Federal Government apparently and continuously has ignored the respect and sovereignty of the citizens of Northern Michigan in their planning process through the lack of adequate information to said citizens;
- THEREFORE BE IT RESOLVED that the Alpena County Board of Commissioners officially opposes and rejects the planning and development of a radioactive nuclear dump within Northern Michigan and specifically within any geographic area of the County of Alpena; and
- FURTHER BE IT RESOLVED that the Alpena County Board of Commissioners emphatically requests that the project currently under development be explained to the Citizens of Alpena County through full public hearings and that an environmental study be made which would involve local citizens, state officials and the federal government; and
- FURTHER BE IT RESOLVED that any plan or proposed dumping of radioactive nuclear waste within the County of Alpena be made an issue to be resolved through a referendum election by the citizens of Alpena County.

MOVED BY: COMMISSIONER ROGER B. PHILLIPSSECONDED BY: COMMISSIONER DELYSLE HENRY

AYES: Commissioners, French, Henry, Lozon, Manning, Phillips, Schultz, Tadejewski, Titus and Huggler.

NAYS: none.

ABSENT: Commissioners LaCross and MacNall.  
By letter Commissioners LaCross & MacNall cast their vote as Aye

STATE OF MICHIGAN: I, CLARA H. NOACK, Clerk of said County of Alpena, and Clerk of the Circuit Court of said County do hereby CERTIFY that the foregoing is a true and correct copy of the original thereof on file in this office.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court and County, this 6th day of July 1976.

CLARA H. NOACK, COUNTY CLERK

*Clara H. Noack*  
Deputy

FURTHER, that copies of the above stated resolution be sent to the following:

President Gerald R. Ford, White House, Washington D.C. 20000

Vice President Nelson Rockefeller, Admiral's House, Washington, D.C. 20000

Senator Philip A. Hart, United States Senate, Capitol Building, Washington D.C. 20000

Senator Robert P. Griffin, United States Senate, Capitol Building, Washington, D.C. 20000

Congressman Philip E. Ruppe, House of Representatives, Capitol Building, Washington, DC. 20000

Governor William G. Milliken, Executive Office, Lansing, Michigan 48900

Lt. Governor James Hammon, Capitol Building, Lansing, Michigan 48900

State Senator Robert W. Davis, State Senate, Capitol Building, Lansing, Michigan 48900

State Representative E. Dan Stevens, State House, Capitol Building, Lansing, Michigan 48900

Oak Ridge National Laboratories, Att. Director, Oak Ridge, Tennessee 37830

Thomas Lomepick, Geologist, United States Energy and Development Administration (ERDA), Washington, D.C. 20000

United States Energy, Research and Development Administration (ERDA), Attn: Chairman, Washington, D.C. 20000

Russell Peterson, Chairman, President's Council on Environmental Quality, Washington, D.C. 20000

Charles Hanis, Chief of Bureau of Renewable Resources of Department of Natural Resources, Lansing, Michigan 48900

Dr. Howard Tanner, Director, Michigan Department of Natural Resources, Lansing, MI 48900

Richard Helmbrecht, Director, Department of Commerce, Lansing, Michigan 48900

Dr. Maurice Reizen, Director, Department of Public Health, Lansing, Michigan 48900

Dale Ball, Director, Department of Agriculture, Lansing, Michigan 48900

Rodney E. Parker, Executive Director, Northeast Michigan Regional Planning and Development, Old Hospital Building, Gaylord, Michigan 49735

Upper Great Lakes Commission, Chicago, Illinois 60600

Pete Brennan, Plant Manager, Huron Portland Cement Company, Ford Avenue, Alpena, MI 49707

National Gypsum Company, 325 Delaware Avenue, Buffalo, N.Y. 14202

Montmorency County Board of Commissioners, Courthouse, Atlanta, Michigan 49709

Presque Isle County Board of Commissioners, Courthouse, Rogers City, Michigan 49779

Mr. CARR. I have no questions but I do thank you for coming and presenting the viewpoint of the council which you represent. As I understand you are the chairman of the—

Mr. TITUS. President of the Northeastern Council of Governments. My statement was my own statement rather than their own. I am not sure all of them would be willing to handle all the language that I have put in there.

Mr. CARR. It was a very eloquent statement.

Mr. TITUS. Thank you, I hope it is eloquent enough. [Applause.]

Mr. CARR. The next scheduled witness is Ms. Mary Ann Coggins, president of the Alpena League of Women Voters. While Ms. Coggins is taking the witness chair, I would merely like to say that we do not wish to cut anyone off. We want to give as much time as possible for everyone to express themselves. It would help us, however if those of you who are going to testify for the remaining essentially half-hour that we have to be with you today, if you can think about your remarks so as to avoid redundancy, and if you can add something else, a different point of view, it would in fact make it more meaningful for the record that we are trying to establish here.

We welcome you to the committee.

#### **STATEMENT OF MARY ANN COGGINS, PRESIDENT, ALPENA LEAGUE OF WOMEN VOTERS**

Ms. COGGINS. Thank you.

Mr. CARR. Thank you for coming and you may make your statement however you wish to do.

Ms. COGGINS. All right, Mr. Chairman, Congressman Ruppe, and members of the committee, I am Mary Ann Coggins, president of the Alpena League of Women Voters. The League of Women Voters support the principle that democratic government depends upon the informed and active participation of its citizens and requires that governmental bodies protect the citizen's right to know by giving adequate notice of proposed action, holding public meetings, and making public records accessible. We object to the secrecy that shrouded this project, to the lack of adequate notice and even time for citizens to participate at this hearing.

Future hearings should be given adequate notice and held at a convenient time for all citizens.

We are a nonpartisan organization. We do not support or oppose political parties or candidates. League members may take action on governmental issues and policies after study, discussion, and consensus.

We do not support or oppose the Federal agencies' plans to test the Alpena for suitability as a nuclear waste disposal site.

However, we do have some questions about this project. Some of these questions have already been asked and discussed but I would like to ask them again as showing our concern.

Who will write the environmental impact statement? And who will pay for this Environmental impact statement?

What are the economic benefits of this project?

Do adequate safeguards exist to make this project acceptable to the public?

Several accidents have occurred in northern Michigan related to the drilling of gas and oil. Would this type of accident or the process of drilling for oil affect the atomic waste storage site?

Where are the atomic plants projected to be in the future?

Why not store the nuclear waste in the Detroit salt deposits to prevent more transportation problems?

If there was an accident, how serious would it likely be?

If this area is chosen as a nuclear waste disposal site, how will it be transported here?

Will the shipping containers be directly stored in the salt deposits?

And last, what volume of nuclear waste does an atomic plant generate?

Thank you.

[Prepared statement of Ms. Coggins follows.]

PREPARED STATEMENT OF MARY ANN COGGINS, PRESIDENT, ALPENA LEAGUE OF  
WOMEN VOTERS

League of Women Voters support the principle that democratic government depends upon the informed and active participation of its citizens, and requires that governmental bodies protect the citizens right to know by giving adequate notice of proposed action, holding public meetings and making public records accessible.

We object to the secrecy that shrouded this project, to the lack of adequate notice and inconvenient time for citizens to participate at this hearing. Future hearings should be given adequate notice and held at a convenient time for all citizens.

We are a nonpartisan organization. We do not support or oppose political parties or candidates. League members may take action on governmental issues and policies after study, discussion and consensus. We do not support or oppose the Federal agency's plan to test the Alpena area for suitability as a nuclear waste disposal site. However we do have some questions about this project.

1. Who will write the environmental impact statement?
2. Who will pay for this environmental impact statement?
3. What are the economic benefits of this project?
4. Do adequate safeguards exist to make this project acceptable to the public?
5. What are the odds of an accident?
6. Where are the atomic plants projected to be in the future?
7. Why not store the nuclear waste in the Detroit salt deposits?
8. If there was an accident how serious would it likely be?
9. If this area is chosen as a nuclear waste disposal site how will it be transported here?
10. Will the shipping containers be directly stored in the salt deposits?
11. What volume of nuclear waste does an atomic plant generate?

Mr. CARR. Thank you very much for your statement and for being with us.

Do you have any questions?

Mr. RUPPE. No, I just want to say that those are certainly some of the most important and embarrassing questions that have to be answered and answered with accuracy and clarity before we move forward with any test program anywhere in the country.

Thank you.

Mr. CARR. Thank you very much.

Ms COGGINS. Thank you.

Mr. CARR. Our next scheduled witness is Mr. Peter Vellenga, and if I mispronounced that I would be happy to be corrected at the earliest possible moment.

#### STATEMENT OF PETER VELLENGA, DEMOCRATIC CANDIDATE FOR STATE REPRESENTATIVE

Mr. VELLENGA. Peter Velenga. I am a candidate for the 106 district and have a number of very serious concerns, as do all the residents of the 106.

I did not prepare a written statement because, while I had called your office, I think about 2 weeks ago, you were unable—and I understand with the time lags on setting this up—unable to get the information out to us regarding exactly what was being proposed.

Now, I would like to make a couple of observations and perhaps also answer a couple of questions that have been already raised.

First, I am very, very concerned about the role of our own DNR because I had also obtained the information regarding the November meetings, and that information was obtained from Mr. Arch Slaughter of the Geological Survey Division.

Second, your questions regarding the environmental impact assessment required by the State of Michigan, I think the answer is, yes, that could have been done in a 2- to 3-day period, no problems in terms of what the Department of Natural Resources at that time prior to this hearing were going to be requiring. The reason why is that in talking with Mr. Slaughter as late as the hearing of the DNR in Marquette, the statement of Mr. Slaughter, who was Assistant Supervisor of Wells, was that, oh, that is no problem. That is going to be done through the Mineral Well Act, and all they have to do is basically what they are going down to—never getting to or touching the questions of what happens afterwards.

So the environmental impact statement would merely be what happens when you drill a hole in the ground, the site that is going to be cleared for the particular drilling, and how you clean up the site afterwards, whether there are any streams within a  $\frac{1}{4}$  mile, et cetera. That would have been the full extent of that environmental impact statement.

I think—and I am going to respond to another thing that I have heard here. We should not be merely saying, I think, here in northern Michigan and, I think, as Mr. Titus said, we get a little hot, but I don't think it is enough to merely say: No, not northern Michigan." While we are hot, it is going to go someplace else and I think that your committee, even though you do not have legislative authority in this area, should take back some very, very strong recommendations regarding the entire nuclear program.

Now, I have carried out some consultations with a nuclear consultant and other people that have been involved in the nuclear industry and have these observations:

One: Nuclear energy, in terms of power-generating plants, is, at best, a stopgap measure. It is, at best, an interim phase for meeting our energy requirements.

Yet, what have we done, in terms of the Federal Government and in terms of Congress? We have put forth and allocated funds for the development of nuclear power as the answer to our energy needs.

I think this needs to be carefully and closely reassessed.

Point No. 2: I think it is essential that we look and investigate the relationship between the industry and the Government in regard to the processing of nuclear fuels and their disposal. Originally, the Federal Government owned all nuclear fuels. That has changed now by act of Congress that the fuels are now owned by the private companies, themselves.

But in addition to this, we have an additional problem that, by congressional action, at the present time the disposal of the wastes are the responsibility of the Federal Government. I know of no other area in the Federal Government where we subsidize industry, and a questionable industry, to that point where we say: "Fine, whatever you want to do with your wastes, you know, go ahead and do it, we will subsidize it."

Now, I would raise, and this question I have raised with Dr. Kuhlman earlier to verify my information. I said, is it a correct statement that you presently have the technology for recovery and reprocessing of the wastes? And the answer I got was the technology is there.

Now, I would ask this committee if the technology is there, why are we talking about terminal storage? I think when we talk terminal storage we are talking about a dump.

Now, if we are talking storage for eventual recovery and the nuclear consultant who is in this indicated we will need these very wastes we are disposing of unless we have a job breakthrough in terms of the breeder reactors to, in fact, continue any type of nuclear program in terms of generating steam in our present electrical plants.

Now, I think that is a serious question that needs to be appraised rather than just what we do with the wastes. If, in fact, this technology is there, I think an assessment has to be made, has to be

made as to what the costs of the reprocessing are: No. 1, how these costs compare—and I will tell you very frankly, I am a smalltown boy, but when we start talking \$4.6 million this year, \$34 million in the coming years for evaluation—just evaluation and study; then we start talking \$100 to \$200 million per disposal site which may or may not work, yes, I am concerned as to where our dollars are going and I would ask this question of the committee as to whether these dollars might be better spent in two different areas.

No. 1: Evaluating and maybe going a step further even than evaluation, into the actual establishment of a reprocessing facility.

Now, I would raise this question; is this reprocessing not being done merely because it is going to be too much of a burden for the companies that are processing it and it is cheaper to produce at the present time the raw uranium rather than take out isotopes that we have got?

The other piece of information that I have is that through a properly run recovery unit if this is established, reprocessing unit, that we can recover all of the long-lived radioactive isotopes and reuse them and then through the fissional process again they would be broken down and recovered and we would end up then not with the 24,400 years and Representative Carr, I believe the total radioactive life on that 24,400 years is the half-life. The total radioactive life is a total of 500,000 years.

And I would submit that with these types of—and I will use it—poisons being put underground with inadequate supervision because we hope we can forget about it when it is down there, I do not think this is a policy that this district should have on anybody else. I think we ought to resolve it here in the district and we ought to have a full hearing here and not force it on another district because if this is in fact the case, I think an awful lot of questions have to be answered.

Regarding the oil drilling; two additional pieces of information; No. 1: It is my understanding that a test has been completed and there is a producing well in Presque Isle within the past 3 or 4 weeks.

Point No. 2: I would concur with the statement of Mr. George McCreery, that I have had numerous consultations with the oil companies and as you start coming up the basin and this is what we are doing, we are coming up the Niagaran basin and as we come up the Niagaran basin in this area, the seismic evaluations are inadequate and the reason why we have had so many bad tests is because they are unable to filter out exactly what is under the ground through the seismic evaluation. Does that mean we will not have oil and gas activity? I would say that that is not the case.

All you have to do is ask the various oil companies whether they are willing to give up the northern two-thirds of the Pigeon River country and they are certainly not. They believe there is something

down there and I would say that the effect of a nuclear dump on the removal of this oil has some very significant effects.

Further, it is my understanding that we are not dealing with totally sealed domes. The oil that is in these domes, which is in the very strata that we are wanting to inject the wastes into, has migrated here and has been trapped in these domes and if that is the case, then it is equally possible for the migration to occur elsewhere. I am not so concerned for the first 50, 100, 247 years we may be handling the close supervision, but what happens at the point we say we are no longer going to supervise and then do we have a waste area of the entire State of Michigan, or perhaps the whole northern United States, when all of the wastes start migrating up? I think these questions need to be addressed.

Thank you.

Mr. CARR. Thank you very much, Mr. Vellenga. To clarify the record, there probably has been some confusion here, but it is not really proposed that we bury spent fuel rods or that fuels are going to be buried into the salt formation. What is being proposed is that the residue, the fission products, the radioactive waste products that are a result of the reprocessing facility, are what are being proposed to be buried, not the plutonium and uranium fuel.

Mr. VELLENGA. Yes, but it is my understanding that the technology is available today to carry out the reprocessing of those very wastes but the costs are high.

If that is the case, and this is my information and I think that should be reviewed if it is true.

Mr. CARR. To clarify, what we are talking about is reprocessing the waste and then there is a waste from that, you see, and that is what is being proposed to be buried.

Mr. VELLENGA. It is my understanding that that is incorrect. I think that that area should be discussed with your science advisors and with experts in the field. My information is that that is an incorrect statement and, in fact, from the information I have, this is a matter of economic benefit to the industry burying it, rather than going the additional expense of total reclamation.

Mr. CARR. Thank you very much, Mr. Vellenga.

I have been given a letter addressed to Congressman Ruppe and I will read it:

DEAR SIR: After discussing the resolution regarding the nuclear waste disposal site, received from Wilson Townsend, Alpena County, Mich., the following action was taken at the July 1, 1976, meeting of the Alpena Soil Conservation District Board of Directors. It was moved and supported to ask that ERDA not locate the nuclear waste disposal in this area and that it be re-located in an isolated area.

Signed, Morris Godfrey, chairman, this is written on the letter-head of the Alpena Soil Conservation District, July 2, 1976.

Without objection, the entire resolution will be inserted in the record.

[Information referred to follows:]

## ALPENA SOIL CONSERVATION DISTRICT

815 MILLER STREET

ALPENA, MICHIGAN - 49707

July 2, 1976

Representative Philip Ruppe  
House of Representatives  
Washington, D.C. 20515

Dear Sir:

After discussing the resolution regarding the Nuclear Waste Disposal Site received from Wilson Township, Alpena County, Michigan the following action was taken at the July 1, 1976 meeting of the Alpena Soil Conservation District Board of Directors. It was moved and supported to ask that ERDA not locate the Nuclear Waste Disposal in this area and that it be relocated in an isolated area.

Sincerely,

*Morris Godfrey*

Morris Godfrey  
Chairman

MG:pt

Mr. CARR. The next person we are scheduled to hear from is Mr. Edgar Kreft. Please join us at the witness table.

**STATEMENT OF EDGAR KREFT, DIRECTOR, DISTRICT 4, ENVIRONMENTAL ACTION**

Mr. KREFT. Mr. Chairman, Congressman Ruppe, members of the committee, my name is Edgar Kreft, I am the acting director of the environmental health section of the District 4 Health Department, which comprises Alpena, Montmorency, Presque Isle, and Sheboygan Counties. I appreciate this opportunity to express the concerns of the environmental health section of the District 4 Health Department, which is responsible for the task of keeping the environment of this area a safe, wholesome place to live and enjoy.

It is with this in mind that I must strongly object to any consideration by the Federal Government or private industry to use any of these northern Michigan counties as a dump site for the radioactive wastes.

We must remember that northern Michigan is a unique area, with an abundance of water as one of its greatest natural resources. There is no other State, which is surrounded by fresh water such as we have in the Great Lakes which surround us, the hundreds of smaller lakes, and with such great quantities of ground water that a well can be drilled most anywhere and obtain all the water a person could use. The very fact that we have all this water all around and on top of the same salt formations, which are being considered as dump sites for radioactive wastes, should be a real cause for alarm.

The main reason salt beds are being considered as dump sites are because the presence of salt beds indicate a dry environment which is needed to keep the radioactive waste containers from corroding. When water is present, as it is here, and could accidentally enter these salt formations, a very corrosive atmosphere would result, with the rapid deterioration of the waste containers and the release of the deadly radioactive materials into our lakes, rivers, and water supplies.

How and why could this happen now in this area, when it has not happened before? First: Extensive oil explorations are in progress, holes are being drilled through the ground water strata into the areas of the salt formations. This could allow water to enter and make direct connection with our drinking water and the radioactive materials.

Second: Mining and quarry operations are being carried on in many parts of the area with much blasting and shaking of the fractured limestone which covers most of this area. This could also allow water to enter the salt formations. We also have whole lakes which, with no warning, drain themselves, and others which appear and disappear with no explanation as to where the water goes. Heat from the waste, itself, could cause thermal heaving and cracking of the formations above the salt, and could also let water in.

It is very easy to see the great dangers of using this area, with its abundance of water, for such underground storage of radioactive wastes.

We are also very concerned and certainly not convinced that the technology is available today to contain this waste safely, even though we hear many such assurances. The history of the handling of radioactive wastes in the last 30 years does not instill a sense of confidence, and I would like to cite a few examples of this performance to date.

In one storage site alone at Hanford, Wash., there have been at least 18 separate incidents where a total of one-half million gallons of radioactive wastes have been allowed to leak into the ground.

In 1973, in one accident alone, 150,000 gallons were lost, and the loss was not even discovered for 50 days!

At a proposed site in salt formations in Lyons, Kans., the Atomic Energy Commission ran a 15-year study and concluded that the area was suitable, and afterwards they changed their minds when the Kansas Geological Survey showed that they had missed large numbers of oil exploration holes which would have allowed water into the salt formations. Also, there was a mine only 1,800 feet away which was using water to mine the salt.

A breakthrough could have occurred at any time. You can see how much was missed in a 15-year study of one site alone! The sad thing about these mistakes are that the results of a radioactive mistake are irreversible.

As of this date, radioactive elements have been found in the ground water beneath the Atomic Energy Commission's facilities at Idaho Falls, Idaho, and at Savannah River, S.C. Plutonium, one of the world's most dangerous substances, has also been found recently in the old Erie Canal outside Monsanto's Laboratory, only 10 miles from Dayton, Ohio.

Even though we have many reassurances and guarantees from the power industries and Federal agencies, their performance to this date is such that it reveals one failure after another. I think that we can conclude that if it took 50 days to discover a 150,000-gallon leak from a surface tank, a leak from a tank buried in our salt formations would not be discovered until the catastrophic effects became apparent in human beings.

I have also noticed that in all the reports and articles which I have read, the only scientists and engineers who give assurances of the safety of the handling of nuclear wastes are those who owe their living to the industry. Most others are very skeptical that it can be done at all.

I here again conclude that the technology is not yet available to assure safe containment of the wastes for the thousands of years needed. In fact, after 30 years of trial and error, the Atomic Energy Commission has not successfully contained this deadly waste for more than a few years without problems occurring.

We must also conclude that, because of the fact that these salt formations in northern Michigan are covered by and surrounded by water, it would be extremely dangerous and foolhardy to consider this area as a radioactive waste dump. We are sure that there are other nonpopulated, dry, arid regions where human beings would not need to serve as guinea pigs for Government experiments.

Thank you.

Mr. CARR. Thank you very much for your very fine and thoughtful statement.

We are running into a time problem which I am going to ask all the remaining witnesses to help us out on.

We are time limited in regards to airplanes and airplane schedules and things like that.

As I have it here now, there are seven, possible eight, people who wish to make a statement for the record and we must adjourn the hearing approximately at 40 minutes past the hour. So I will ask your cooperation in limiting your verbal statements to 2 minutes. We will without objection get your full prepared statements in the record and they will be made a part of our report when we issue it in Washington.

I ask you to bear with us. We do not mean to cut other people off but at some point, we run up against the end of the day just like everybody else but we do want to hear from you.

The next person is Mrs. Doris Schaller.

#### STATEMENT OF DORIS SCHALLER

Mrs. SCHALLER. Thank you.

Mr. CARR. Without objection, the full prepared statement of Mrs. Schaller will be placed in total in the record.

[Prepared statement of Doris Schaller follows.]

PREPARED STATEMENT OF DORIS SCHALLER, ALPENA, MICH., JULY 6, 1976

All confrontations over nuclear power, from Vermont to California, are replays, with local variations, on the essential theme: How safe is controlled nuclear fission?

#### NUCLEAR WASTE

All levels of the nuclear fuel cycle produce radioactive hazards, starting with the mining and milling of uranium, the preparation of the fuel, and even the tailings left after the mining operation. While all of these pose serious hazards, the most serious is the problem of waste materials removed from the nuclear generator itself.

The best testament to the misplaced value of the American atomic establishment is its history of doing everything backwards. Two decades of boiling radioactive waste were produced by the weapons program before the AEC addressed itself in any meaningful way to solving the problem of waste disposal \* \* \* Reactors have been on the line for over a decade and the ERDA is just beginning to direct itself to that emergency core cooling system as a way to arrest a core melt-down accident before it goes to far \* \* \* the nuclear-rocket program steams along without a scrubber to capture the radioactive effluents produced by each experiment.

The past record of the regulatory board, the Energy Research and Development (ERDA) (AEC) is our only gauge of the boards competence to handle the problems of the future.

#### PAST RECORD REGULATORY BOARD

We know that millions of gallons of liquid waste is stored in large tanks in the state of Washington and Georgia in addition to those solid wastes buried in shallow trenches in Idaho. There are exposed liquids as well. The AEC admitted that ducks feeding on algae in waste water trenches at the Hanford, Wash. works were so radioactive that they "would have given a person 5 times the maximum permissible dosage of radiation if eaten."

There have been spills at the 560 square-mile waste storage facility at Hanford, Washington when 11 of 151 containers developed leaks between 1944 and 1970. The largest spill was in June 1973, with 115,000 gallons of radioactive waste, which seeped from a corroded steel tank into the soil under Hanford. Fifteen spills here in 7 years total 422,000 gallons of waste.

Then there is the case of drinking water in the Colorado town of Bloomfield, midway between Boulder and Denver. The presence of tritium—heavy hydrogen in the Bloomfield reservoir was found to be 40 times higher than normal. The normal level in Colorado is about 1,200 picocuries per liter of water; the highest reading in the Bloomfield reservoir was 23,000 picocuries of tritium per liter. The tritium contamination was traced to waste dumps at the AEC's nuclear weapons factory at Rocky Flats, 4 miles from the reservoir.

In a creek 1 mile from the weapons site the concentration was 3 million picocuries per liter. (NOTE: Colorado standards hold that 1 million picocuries of tritium per liter is in the upper safety limit.)

#### SALT MINES

The ERDA seems to favor burial in salt mines, saying that there is no risk of leakage from the repository into the biosphere. This is questioned by geologists. They might be safe for normal products but because of very large quantities of extremely poisonous substances, it is required that the repository be absolutely free of leakage for a period of hundreds of thousands of years. No responsible geologists can guarantee this. The tanks have a life expectancy of only 25 years or so. \* \* \* How do we know that in a 1,000 years this atomic poison won't leach into our ground water and turn the Great Lakes into a vast sea that is lethal to all forms of life?

How do we know that the great earthquake of 2003 won't fracture the deadly atomic vaults exposing the human race to sure and swift extinction?

Render this atomic garbage harmless, perhaps neutralize it or put shutters on our nuclear powerplants and stop building more of these atomic garbage creators.

In todays regulatory process that deals with nuclear power facilities that make this waste that we are talking about there is a tendency to review such safety concern separately and to conclude that the specific concern, by itself, does not present an undue safety hazard to the public but I would point out that attention should be given to the summation of all the individual safety hazards and review the entire technology \* \* \* Just how many safety concerns does it take to conclude that the whole system is unsafe?

I think that is what the three top G. E. Engineers were trying to tell us when they resigned, and it underscores the validity and importance of the testimony that was brought during the AEC's national safety hearings in 1972 which discredited the safety research practices of G. E. and other manufacturers.

The resignation of Dr. Robert Pallard from the Nuclear Regulatory staff over the agency's coverup of serious safety questions confirms these research and safety deficiencies in the nuclear program.

The latest outrage in the regulatory program is granting Big Rock exemption for life on the Core Cooling System (June 11, 1976 PNR pol). Big Rock

has in the past received several exemptions and it is evident that this is an attempt to perpetuate a pattern of noncompliance with the regulations. When such grants or variances are made the law becomes meaningless and Michiganders don't like it.

#### CONCLUSION

In any system that policies itself there is bound to be negligence and everyday incompetence. It is important to note that under President Ford's new fiscal 1977 budget the EPA is reducing its manpower and program for monitoring ionizing radiation in the environment. The responsibility for monitoring nuclear power pollution is to be left mostly with the Nuclear Regulatory Commission and NRDA. We have the mouse guarding the cheese again.

With regulations becoming a meaningless facade, Michigan should give an emphatic "No" to burial of atomic waste in this State.

Mrs. SCHALLER. Thank you for the privilege of speaking. All confrontations over nuclear power, from Vermont to California, are replays, with local variations on the essential theme, how safe is controlled nuclear fission?

Nuclear waste: all levels of the nuclear fuel cycle produce radioactive hazards, starting with the mining and milling of uranium, the preparation of the fuel, and even the tailings left after the mining operation. While all of these pose serious hazards, the most serious is the problem of waste materials removed from the nuclear generator itself.

I am skipping part of my speech for the purpose of saving time.

The best testament to the misplaced value of the American atomic establishment is its history of doing everything backwards. Two decades of boiling radioactive waste were produced by the weapons program before the AEC addressed itself in any meaningful way to solving the problem of waste disposal. Reactors have been on the line for over a decade and the ERDA is just beginning to direct itself to that emergency core cooling system as a way to arrest a core meltdown accident before it goes too far. The nuclear rocket program seems to steam along without a scrubber to capture the radioactive effluents produced by each experiment.

The past record of the regulatory board, the Energy Research and Development, is our only gauge of the board's competence to handle the problems of the future. We know that millions of gallons of liquid waste is stored in large tanks in the State of Washington and Georgia in addition to those solid wastes buried in shallow trenches in Idaho. There are exposed liquid as well. The AEC admitted that ducks feeding on algae in waste water trenches at the Hanford, Wash. works were so radioactive that they "would have given a person 5 times the maximum permissible dosage of radiation if eaten."

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into the soil under Hanford. Fifteen spills here in 7 years total 422,000 gallons of waste.

Then there is the case of drinking water in the Colorado town of Bloomfield, midway between Boulder and Denver. The presence of tritium—heavy hydrogen in the Bloomfield reservoir was found to be ten times higher than normal. The normal level in Colorado is about 1,200 picocuries per liter of water; the highest reading in the Bloomfield reservoir was 23,000 picocuries of tritium per liter. I am shortening this. But there was a creek 1 mile from the weapons site where the concentration was 3 million picocuries per liter. Colorado standards hold that 1 million picocuries of tritium per liter is in the upper safety limit.

Mr. CARR. I hate to do this. We have gone 4 minutes into someone else's time.

Mrs. SCHALLER. All right.

Mr. CARR. And if we do not give them their time, we have an imposition.

Mrs. SCHALLER. I will make it short. In today's process that deals with this waste, there is a tendency to review each safety concern separately and to conclude that the specific concern, by itself, does not present undue safety hazards. But I would point out that attention should be given to the submission of all the individual safety hazards and review the entire technology.

Just how many safety concerns does it take to conclude that the whole system is unsafe?

In conclusion, in any system that applies itself, there is bound to be negligence. It is important to note that under President Ford's new fiscal 1977 budget, EPA is reducing its manpower programs for monitoring the ionization radioaction in the environment.

The responsibility for monitoring nuclear power pollution is left mostly with the Nuclear Regulatory Commission and ERDA. We have the mouse guarding the cheese again. Thank you.

Mr. CARR. Thank you, Mrs. Schaller.

My time is getting even more critical and I have to warn the remaining people that you will have only 4 minutes to make a statement now. We are down to that. I am going to have to hold you to it very tightly. I regret that we have to do that, but we are in a terrible time crunch here.

The next person scheduled is Mr. Raymond Schaedig. He did not check in.

Mr. SCHAEIDIG. I canceled my time out.

Mr. CARR. Thank you very much, you saved me 30 seconds.

Dr. Gerald Drake is next slated to speak to us.

Without objection, we will put your prepared statement in the record. If you could summarize in a quick minute what you want us to consider, it will be appreciated.

[Full prepared statement follows.]

STATEMENT AT ALPENA HEARINGS, JULY 6, 1970

Gerald A. Drake, M.D.

My name is Gerald Drake. I am a native of Northern Lower Michigan and have practiced internal medicine in Petoskey, across the state from here, for over 25 years. I am here to object to the use of Northeastern Lower Michigan as a storage place for nuclear wastes.

The use of this area, even for temporary storage, would seem unnecessary because we already have eleven such sites in the United States. They contain more than nine million cubic feet of waste including about 200 pounds of plutonium. There are six commercial sites and five others run by the Holifield National Laboratory. It seems unnecessary to risk contaminating this area by bringing in potentially lethal radioactive materials when other locations, nearer reprocessing plants, already exist.

If the intent is to use the salt beds underneath this location for more permanent storage, this again brings up serious reservations. Attempts to use the salt beds near Lyons, Kansas and Carlsbad, New Mexico were both abandoned because water from man made borings seeped into the Kansas location and brine was found in the New Mexico site. Salt beds for nuclear waste storage must be protected from water because it greatly increases the corrosive effect and risks contaminating the water source. It seems unwise to use a location bordered on one side by Lake Huron and on the other side by the Pigeon River Valley where oil well drilling is just getting underway. It might well be a mistake to attempt to store or dispose of these wastes anyplace in a state which is laced with rivers and streams, dotted with lakes and

almost surrounded by water. Salt beds are normally associated with other valuable minerals. The monitoring and retrieving of wastes in salt beds may be difficult.

Another consideration, which bears on this issue, is that the State of Michigan as a whole has already made a significant contribution to absorbing the risks involved in the development of nuclear power. First in 1962, the 75 megawatt boiling water reactor at Big Rock, in the Northwest corner of the Lower Peninsula, attained criticality. Most of us were enthused. However, later we learned, Big Rock is classed as experimental. As a result, different forms of fuel and fuel cladding have been used. This has caused an increased release of radioactivity to the environment as a result of fuel failures. These releases, according to accepted standards, have not constituted a threat to the public. Yet, the potential for it may be there. Michigan residents are being asked to absorb the risks of Big Rock's experimentation.

In 1969 Big Rock became the first commercial plant to have plutonium-239 added to the fuel rods. For those unfamiliar with the biologic nature of plutonium-239, it is the most toxic substance handled in quantity by man. It is man-made and does not occur in nature. It has a 24,400 year half life. The amount of it retainable on the point of a pin or the size of a grain of pollen, can, if inhaled, produce lung cancer. The injection of 2.50 millionths of a gram into beagle dogs killed them all from bone cancer. This is the material

with which proponents of nuclear power, through the liquid metal fast breeder reactor, plan to build much of our economy. Plutonium will be a part of the waste disposal problem. Extraction methods are unable to remove more than 99.99% of it economically, which is not enough. 4

On October 5, 1966 in Southeastern Lower Michigan, Fermi I, the first attempt at a liquid metal fast breeder reactor, was within minutes of a meltdown before it was brought under control. This event might have caused thousands of deaths. Damage was so extensive that it could not be put back into operation. John Fuller, the author of "We Almost Lost Detroit", a history of Fermi I and nuclear power generally, states that no solutions have been found to handle the accumulations of radioactive wastes.

Within recent months an earthquake passed about 25 miles north of Fermi I. Geologists were surprised because such an event was not expected in the area. Michigan residents are absorbing these risks.

Across the state in the Southwest section of Michigan the Palisades nuclear plant went into operation in 1971. It must have one of the poorest operational records of any plant built. Consumers Power, owners of the plant, is suing the construction company for over 300 million dollars. The plant leaked radioactivity for nine days before it was detected. One monitor was known to be inoperable and another was plugged with leaves. By presently accepted standards the leaks were supposedly harmless, yet Michigan residents have absorbed this risk.

I might add to completely cover the State of Michigan, the proposal on the part of the Navy Department to make the Upper Peninsula the location of Seafarer. In the event of nuclear war, the Upper Peninsula

would become a prime target. Four prominent scientists recently indicated that such a war was probable before the year 2000 and would kill a billion people. Michigan residents have been asked to absorb this risk.

In Nov., 1974, in a lecture at the University of Minnesota, Frank K. Pittman, director of the then AEC's division of waste management and transportation, said that the disposal of nuclear power plant wastes was not far from a million year program. I don't think the people of this state want any part of that.

It seems to me that the waste disposal problem points up another of the grave uncertainties about this form of energy. It's development should be slowed, at least long enough to determine if conservation procedures and the rapid development of other energy sources can't solve our problem.

One of our Petoskey News Review editorial writers, Bob Clock, seemed to sum it up well by saying that "sweeping radioactive dust under the green carpet of Alpena County is not the answer to the nuclear waste disposal problem just as the Seafarer grid is a lousy way to say good-bye to planet Earth."

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- Disposal of Nuclear Wastes, Kubo and Rose. Science. Dec. 21, 1973.
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- Reports of Operations at the Big Rock Nuclear Power Station. Public Library, Charlevoix, Michigan.
- RADIOBIOLOGY OF PLUTONIUM, Stover and Jee. The J. W. Press, University of Utah, Salt Lake City, 1972.
- WE ALMOST LOST DETROIT, John Fuller. Readers Digest Press, Pleasantville, New York, 1975.
- "Nuclear Threat", Lloyd Shearer. The Detroit Free Press. May 16, 1970.

## STATEMENT OF DR. GERALD DRAKE

Dr. DRAKE. Mr. Chairman and members of the committee, I will keep this just as brief as I can. I want to make just a few points.

It seems to me unwise to develop a nuclear waste material dump between Lake Huron and the Pigeon River Valley where well drilling operations are just getting underway.

In fact, it seems unreasonable to me to start a dump any place in the State of Michigan which is literally laced with rivers and streams, it is dotted with lakes and virtually surrounded by water. Someday, sometime, these waters will find their way into any nuclear deposit in the State.

Further, I think that we in the State of Michigan have had our share of the risks involved in the development of nuclear power. The Bigrock plant went into operation in 1962 over on Lake Michigan directly opposite us.

We did not know when it went in that it was an experimental reactor but it is. It was the first reactor, commercial reactor, in the United States to use added plutonium in the fuel rods.

As a result of the experimentation, there have been many leaks, leaks resulting in increased release of radioactivity to the environment.

Supposedly, there have not been enough to cause any health effects. But yet we have taken that risk.

Bigrock was the first plant to use added plutonium; and to point out how dangerous the inhalation of the amount that you could put on the point of a pin, or the amount equivalent to a grain of pollen, will produce lung cancer. It was pointed out earlier, we did not have to worry because there would not be much in their wastes. This is 1 gram weight. If this were divided into 400,000 parts and injected into a beagle dog, he would die from bone cancer. This experimentation was done at the University of Utah.

This material will be coming to the Alpena area for permanent storage.

In fact, the dose is probably less than that because the experimenters wanted another \$1 million to find out what the minimum dose was. Across the State, down into the southeastern corner, officially one almost melted in October 1966. This could have killed thousands of people. It was the first attempt at a liquid metal fast breeder. Across the State, Consumers Power palisades plant probably has the poorest operational record of any plant ever built.

The Consumers people are suing the contractor or construction man for \$300 million over this plant. It leaked radioactivity for 9 days before it was detected. The people of the State of Michigan absorbed that risk.

To complete the story, the Upper Peninsula has been asked to be the site of the Seafarer and, in the event of a nuclear war, it would

become a prime target. I feel that the people of this State have absorbed enough in the way of nuclear risks and certainly there is no reason why we should have to take on a waste depot in this corner of the State.

Someone summed it up well, I thought: "Sweeping radioactive dust under the green carpet of Alpena County is not the answer to the nuclear disposal problem." Just as the Seafarer grid is a lousy way to say good-bye to planet Earth.

Thank you, Mr. Chairman.

Mr. CARR. Thank you, Dr. Drake.

I ask unanimous consent that a document by E. H. Reilly, a resolution by the Alpena Township, a statement by Martha Drake, and a statement by C. B. Wright, be included within the record.

Without objection, so ordered.

[Information referred to follows:]

*Permission Granted by Margo North  
Representative of Smithsonian Inst.  
To use Article for presentation at  
Nuclear disposal site hearings to be  
held at Alpena and Lansing Mich  
on July 6 - 76.*

PLUTONIUM: 'FREE' FUEL OR INVITATION TO A CATASTROPHE?

Plutonium. The stuff of bombs. Intensely radioactive for hundreds of thousands of years. For many Americans, the very word invokes a dread akin to botulism or anthrax or worse.

Plutonium is indeed deadly, and more is being produced every year. Men make it deliberately for weapons of war, and they make it inadvertently in nuclear power plants. Now the United States and other countries are deciding whether to use it to fuel nuclear reactors of the future.

Some critics contend that a decision to use plutonium as a fuel will inevitably lead to a disaster. Sooner or later, they say, human error will cause an accident during processing, shipping or in a power plant, and plutonium will be released to the atmosphere, causing widespread death and disease. Even worse, they say terrorists could seize a shipment, put together a crude atomic bomb and bring a government to its knees. Finally, they raise the problem of disposing of a substance that remains dangerous many times longer than the lifetime of any recorded civilization.

But supporters of the "plutonium economy" argue that this potent source of energy will eventually be urgently needed, when coal, for instance, presently plentiful, becomes too scarce, too polluting and too expensive. They say that the element is not as

toxic as it has been made out to be, and that present techniques for handling and guarding "hot" substances are more than adequate to prevent catastrophe. Whether this energy is worth the risks is what the fight is all about. The plutonium used in reactors is an oxide.

Like most other elements, plutonium exists in different forms called isotopes (each isotope of an element has the same number of protons and electrons, but a different number of neutrons; hydrogen, for example, exists naturally in three isotopes). A unique characteristic of some plutonium isotopes is that they are self-heating: a chunk of Pu 239 is noticeably warm to the touch; another isotope, Pu 238, is literally too hot to handle. They are hot as an indirect result of their radioactivity: their crystals absorb their own radiation.

All 15 isotopes of plutonium are extremely radioactive. Its radiation has little penetrating power, however: a piece of cardboard can be an effective shield, in contrast to the walls of concrete needed for other radioactive elements. But this low power presents its own deadly problems. If a speck of plutonium manages to get inside the body, its radiation is dissipated within a very short space, severely damaging the tissues surrounding it. A speck in the lungs can cause fibrosis within a few weeks.

Experiments on laboratory animals leave no doubt that plutonium is a potent carcinogen. Most commonly, airborne particles can cause lung cancer. In introduced through the mouth or an open wound, plutonium tends to migrate to the liver and skeleton, where it can produce cancer of those parts of the body.

No one doubts, either, that plutonium can be harmful to human health when incorporated in a bomb. Nuclear war has been a specter for 30 years, but now some physicists are warning that terrorists, too, may turn to atom bombs. In 1974 atomic physicist Theodore B. Taylor and lawyer Mason Willrich published "Nuclear Theft: Risks and Safeguards" to spell out the danger. They argued that making a "crude fission bomb" required little more than a scientifically trained mind and about 12 pounds of plutonium oxide. Acquiring the plutonium would be relatively easy for one person acting alone, a criminal group or a dedicated terrorist group, they said, because security was lax at nuclear plants.

Right, now, extracting plutonium from reactor wastes is difficult and dangerous: the spent fuel is extremely radioactive, and the plutonium is much too polluted with uranium and reaction by-products to be easily converted into bomb-grade material. But if the Nuclear Regulatory Commission (NRC) decides in favor of plutonium as a reactor fuel, the situation will change radically.

Now that uranium is becoming scarce and expensive in the United States, we are faced with the prospect of becoming as dependent on foreign sources for uranium as we are for oil, or switching to another nuclear fuel. By adding "free" plutonium to uranium in a mixed-oxide fuel, this country could significantly stretch its uranium supplies. The problem is that the plutonium would have to do a lot of traveling before it ended up as fuel in a reactor core. Starting as a component of spent fuel, it would be shipped from the power plant to a recycling center. It would then be shipped to any of a dozen fuel fabrication plants, and from there to any of the 100 or more power plants expected to be in operation

by 1980. (The danger would arise after recycling, when the separated plutonium would be in a form terrorists could use; by the 1990's there could be enough plutonium in transit every year to make 20,000 atom bombs).

The nuclear industry insists that existing safeguards can keep all this plutonium from hijackers. The amount that can be shipped on passenger aircraft is limited, and no containers which weigh 500 pounds or less may be shipped in open trucks, railroad cars or ships. Trucks are marked so they can be identified from the air, and truck crews must maintain regular radio contact with shippers. For stored material, precautions take the form of large security staffs and physical barriers. Nuclear plant guards search visitors and employees and patrol the grounds.

Critics insist that none of this would stop a dedicated group of would-be terrorists. They point out that a Pennsylvania utility was fined \$8,000 in March after a former employee evaded a guard, scaled an eight-foot fence and entered a security area. They concede that the shipping record is perfect so far, but argue that the opportunity for theft rises with the volume of shipments.

In many ways the "ultimate garbage crisis" is the most intractable of all the problems facing the nuclear industry.

At present, large quantities of nuclear wastes containing plutonium are stored in double-lined stainless steel and concrete containers buried at Hanford, Washington. The system is not perfect: a 1972 AEC report noted that at least 660 pounds of plutonium had been allowed to leach into the ground. And burial at Hanford is plainly a temporary solution because plutonium 239

remains radioactive for a quarter of a million years. Spent fuel is piling up at existing nuclear power plants because at the moment there are no operational recycling centers. The Plant at West Valley, New York, is closed until at least 1983 for modifications. A plant built in Illinois by General Electric for \$64 million does not work and has been shut down. A third, being built in Barnwell, South Carolina, awaits NRC licensing.

#### ONGOING SEARCH FOR WASTE DISPOSAL

So far the search for a permanent method of disposal has led the nuclear industry down a number of blind alleys (SMITHSONIAN, April 1974), and no definitive answer is in sight. The government has considered burial in stable geological formations (Kansas salt mines were an early candidate), launching into space (possibly into the sun, for in that thermonuclear hell a little plutonium would present no problems), and using modern alchemy to transmute the plutonium into something less dangerous (it's not easy). ERDA said last year that burying nuclear wastes in stable geological formations looks most promising.

By any criterion, plutonium is an unpleasant substance to have in circulation. While its actual toxicity may not equal its reputation, the threat that it poses as the raw material of bombs puts it in a class by itself. The nuclear industry believes that its safety procedures can reduce the risks to a sufficiently low level to allow exploitation of its benefits as a fuel. Opponents argue that the benefits do not justify the risks, some going so far as to say that no benefits could justify the risks.

The scientific and technical people will have their say. But whether the benefits outweigh the risks is not a scientific question; it is a question of policy. That's where the American public comes in.

Before we decide, we should know that there are other choices. The first is solar energy in its many forms: direct heating and cooling; conversion to electricity; windmills; even the ocean thermal devices proposed by space companies.

A second possibility, fusion power, is also being actively pursued as a long-range solution. It offers some of the same benefits as the sun itself: clean energy, few problems, and an almost inexhaustible source of fuel in seawater. So far, fusion power is familiar only in the form of so-called hydrogen bombs, but physicists are ever so slowly learning to contain fusion reactions so that their heat can be harnessed like any other source of energy. The most promising results to date involve the use of lasers to supply the unearthly heat needed to start a fusion reaction.

The obvious option, of course: coal, the black rock that used to heat our homes and drive our ships. This country presumably still has enough coal to last us hundreds of years. But, like plutonium, coal involves decisions that are not simple. We must consider the losses, as well as risks, while weighing the benefits.

Our federal government is quietly adopting a policy of exploiting Western coal that lies under public land, or land to which mineral rights were reserved. That coal is claimed to be cheaper than Eastern coal, and the utilities and energy companies are anxious to dig in.

Like the plutonium question, all our energy decisions are complex. Worse, they are all interrelated. The scientists can tell us how dangerous plutonium may be, the economists can tell us how much electricity generated from Western coal will cost, but only we can decide which is worth the cost and which is not. \_\_\_\_\_

*my opinion*

I believe that as long as there is this much controversy, and as long as the word dangerous-is associated with nuclear energy and its wastes or by-products, that our area would suffer economically at this point in time. Some of the top scientists of the world cannot agree on the potential hazards of nuclear wastes.

I think that we have to consider that in part "the economy of Northeast lower Michigan is dependent on tourist and summer residents." From the response that I have received at my office I believe that a nuclear waste site in this area would have a devastating effect on this economy. There are also many other potential hazards that have the possibilities of endangering our very lives and those of generations of the future.

It is also apparent that when our government finds something that it wants badly enough that it will find a way of getting it. This has been proven many times in the past by take-over of Indian lands, condemnation<sup>NATION</sup> of property for fight a ways or other uses, and the list is endless.

So for this reason I am opposed to any type of testing anticipated until a much larger degree of the population of our country are assured and educated to the fact that nuclear waste dump sites do not present a hazard to our generation or those of the future.

*D A Riley*

RESOLUTION

WHEREAS the Federal Government and various of its agencies have made a determination that the Alpena, Montmorency and Presque Isle areas could be ideal areas for disposal of nuclear waste materials; and

WHEREAS the Federal Government and its various agencies have announced plans to conduct drillings at the shale quarry located ten miles West of Alpena in Wilson Township without having consulted or notified any of the local governmental units of such plans; and

WHEREAS the Alpena Township Board agrees that the people of Alpena Township and Alpena County should be afforded the opportunity to be informed and made knowledgeable of whatever plans the Federal Government and its agencies have for the disposal of nuclear waste in Alpena County as it may affect their right to life, liberty or property; and

WHEREAS the Alpena Township Board has not been informed directly or indirectly of any plans of the Federal Government or its various agencies to schedule any hearings wherein the Federal Government could inform the people of Alpena Township and Alpena County of its plans to use Alpena County as a nuclear waste disposal site, nor has it been informed directly or indirectly of any hearings wherein the people of Alpena Township of the County of Alpena may express their views on such a project; and

WHEREAS the Alpena Township Board further believes it is the people of Alpena Township's right and the County of Alpena's right under the Constitution of the United States and the State of Michigan to be informed and to be heard on such a matter to the extent that such a plan may endanger each person's right to life, liberty, property and the pursuit of happiness:

THEREFORE, BE IT HEREBY RESOLVED that the Alpena Township Board does hereby go on record as being opposed to the Federal Government or any of its agencies conducting any test drilling whatsoever for the purpose of determining whether or not Alpena County would be a proper site for a nuclear waste disposal site until such time as the Federal Government and its various agencies conduct and hold a series of public hearings wherein the people of Alpena Township and the County of Alpena can attend and be informed and be heard on various matters concerning such a nuclear waste disposal site and how it affects their Constitutional right to life, liberty, property and the pursuit of happiness.

AYES: Gerald Fussey, Stanley Mischley, Genie Diamond, Christine Dubey and D. H. Riley

NAYS: None

ABSENT: Gerald Nowak

*Christine M. Dubey*  
*Alpena Twp. Clerk*

*D.H. Riley*  
*Alpena Twp. Supervisor*

STATEMENT OF MARTHA DRAKE, 230 FAIRVIEW, PETOSKEY  
MICHIGAN, 49770

JULY 6, 1976

Our area is a prime resort area. It is our chief source of income. Who is going to want to vacation in an area that contains radioactive wastes?

Nuclear power is not cheap. It is as expensive as coal according to actual figures for 1974 as reported by Electrical World, the McGraw Hill electrical trade magazine. Why not stick to coal, which is very plentiful and can be cleaned up, until solar is developed, and not pollute anymore areas fooling around with a dead end technology- nuclear power. It is expensive, uranium is running out and even the pro nuclear people see it only as an interim measure. Conservation and coal makes much more sense for the interim.

*Martha Drake*

References: A Time To Choose, Ford Foundation Energy Study  
Electrical World, Nov. 15, 1975, 19th Steam Station  
Cost Survey

Hearings On Waste Dumping in Northern Michigan

A solution to the very complex problem of waste disposal, i.e. uranium waste, seems to have been resolved very simply by the recent proposition #15 vote in California, an overwhelming vote of 2 - 1 in favor of Nuclear power continuing in that State, <sup>which</sup> /would seem to us to give a climate of little objection to burying all poisonous nuclear waste in that State.

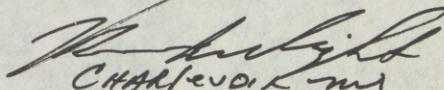
We in Northern Michigan object to this poisonous waste dumping, and furthermore we, the undersigned, object to nuclear power and feel all atomic plants in our Nation must be phased out, and with all seriousness we believe there should not be burying of poisonous waste in any State. It seems very feasible to us that these plants could be phased out by "burning the present stocks of plutonium and thereby transforming them into less hazardous substances", which has been suggested by some. In this way we feel the plants could begin a phase-out program, and we could begin using our great technical minds and resources to initiate a safer more prestigious energy source.

Can any of you Gentlemen be honestly sure "deep in your gut", that this present nuclear industry is not contributing in a highly measurable way to the almost epidemic cancer rate in our Nation, especially leukemia?

Signed

K. B. WRIGHT

MR + MRS


  
CHARLES D. K. M.

Mr. CARR. We are down to again 1 minute apiece and Mr. Leonard Brandt is up.

**STATEMENT OF LEONARD BRANDT**

Mr. BRANDT. I will confine to alluding to what we have in there. So we may save a little time in your behalf, we can limit it to that.

Mr. CARR. We appreciate that, Mr. Brandt, and without objection the entire statement of Mr. Brandt is ordered into the record.

[Prepared statement of Leonard Brandt follows:]

My name is Leonard Brandt. I am here in behalf first as a life time area citizen. With a college education and a lot of experience in common sense political psychology.

In behalf of the county planning and zoning committee of Montgomery County who voted, at June 11, 1976 meeting six to two in opposition to test drilling until a responsible congress (not agencies) gives us more research and guaranteed safety information to satisfy the people.

I am also the secretary of the Hillman Township Planning and Zoning Committee and at our last meeting June 21 and the previous meeting on May 17, 1976 a unanimous vote was cast to oppose test drilling for the same above reasons.

We the people cannot help but feel that government officials in their elected offices on state and national levels have a tendency to develop a hungry appetite for power to rule. To make it more forceful committees and agencies are created till these numbers burst at the seams and for financing the same, the producers of wealth go broke. Through this process of building power, the government now has overbalanced the power scale, putting the people at their mercy. It should be just the opposite. Therefore, we can no longer trust the government with its built in agencies and courts to fully protect the rights of the individuals within their environment.

Concerning nuclear energy wastes, we cannot trust the government even to get their foot in the door because of past demonstrations in honesty and trust backed by justice within the framework of capitalism and free enterprise. It seems that our economic system is more and more being deteriorated by scrapping our American Heritage and leaving the powers that be slowly force us into a One World Socialist Government, which distributes its wealth all over the world. Taking from the haves and giving to the have nots regardless of abilities to prosper. From this view, wherever you are and whoever you are check back to February 10, 1972 when Executive Order #11647 was adopted. The creation of Regional Governments which eventually on purpose eliminates a free government of, for and by the people.

Since that kind of collectivist power-crazed bureaucracy cannot operate within the framework of our United States Constitution, it chose to write a new one which was prepared under the direction of Rexford Guy Tugwell at the "Center For the Study Of Democratic Institutions" and some of its policies are already being practiced. This is no secret to the congressmen because it is at their disposal.

Because of this view we strongly feel that if the scientists had the knowledge to create the waste they should be just as knowledgeable in producing a neutralizer that renders it not dangerous to the life on this planet.

Leonard Brandt

I was instructed by the chairman of the county committee to bring back a report of the results of this meeting.

Mr. BRANDT. My main concern is that in the past, many bureaucracies, agencies, and committees have been developed, both in the Federal and State governments and these governments seem to be operating with one hand not knowing what the other hand is doing without the concern of the people whom they represent.

Therefore, I feel that on the Federal level, there is already operations in action that will permit actions such as are in existence today like the Union Carbide organization and so forth, that have a foothold when they say that they may overrule State governments, in effect, and to heck with the public.

This I do not think is fair to anybody. It is in violation of our constitutional rights. It is in violation of the philosophy of the Constitution that relates to it and it will definitely endanger the environment of the people as we go on in life.

And if they have—if the people who have invented this end product that we have to put up with, they certainly should have the technology and scientific knowledge to invent something to neutralize it. If they cannot do that, throw it out, get rid of it and we will go back to kerosene lanterns and lamps until we find a better way. I do not think we should turn our backs on anything that will produce energy other than that type of energy, even gasoline and fuel oils. Thank you.

Mr. CARR. Thank you, Mr. Brandt.

Next is Mr. Steve Fletcher.

Mr. FLETCHER. I will yield, Mr. Carr, to Bob Scott who has a statement prepared for the professional engineers.

Mr. CARR. All right, thank you.

Mr. FLETCHER. I will give my prepared statement for the record.

Mr. CARR. Thank you. Without objection, the statement of Steve Fletcher will be entered in the record

[Prepared statement of Steve Fletcher follows:]

REMARKS OF STEPHEN H. FLETCHER  
BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES  
INTERIOR COMMITTEE; SUBCOMMITTEE ON ENERGY AND ENVIRONMENT  
ALPENA, MICHIGAN

JULY 6, 1976

Gentlemen:

First, I wish to thank you for this opportunity to state Alpena Power Company's position in regard to Nuclear Waste.

Northern Michigan has one overriding problem which lends itself to no easy solutions. Jobs of every kind are diminishing in numbers throughout Northern Michigan and the Alpena area is very familiar with unemployment rates of 20% or more. In a study done for Alpena Power Company by Stone & Webster Management Consultants of New York dated June 1976, the following facts came to light concerning our major employers locally.

That due to the high cost of transportation, high taxes, and intense labor problems, no expansion is anticipated in the Alpena area, and indeed, some of those contacted are moving parts of their operations elsewhere.

In short, no relief is in sight for our unemployed. We need jobs of whatever kind to allow our citizens to live with dignity.

Insofar as the safety of nuclear power is concerned, the industry has an unparalleled record. According to the Blue Ribbon panel of scientists who conducted the Reactor Safety Study, the chances of your being killed in an automobile accident are 1,250,000 times greater than being fatally injured in a nuclear accident. Obviously, we are after the wrong culprit in these hearings -- we should be banning automobiles rather than nuclear power.

The obvious answer to this line of reasoning is that we need automobiles. The fact that is overlooked is that if we do not use our nuclear option there will not be enough energy to fuel what jobs we have presently let alone to expand our economy to accommodate new workers coming into the system.

If we are to maintain our standard of living, we must have jobs. In order to have jobs, we must have energy and to have energy, we must have nuclear power, with nuclear power there is waste material.

Alpena Power Company urges the investigation of nuclear waste sites locally so we will be able to proceed toward a more productive tomorrow. If the sites locally prove to be unsafe, then they will not be recommended by ERDA. If they are, they will be safer than your car or your home.

The initial reaction of some people without facts has been of such a scale as to be tantamount to lighting a gas well fire to roast marshmallows.

Let's ascertain the facts, and if we are lucky enough to be chosen as a site, let's put our people to work.

Mr. CARR. The next witness is Jim Corven, East Lansing. Is that correct? I am sorry to have to limit you. We will be glad to have your full statement ordered into the record.

Without objection, so ordered.

[Prepared statement of Jim Corven follows:]

There are interests who are proposing to change Alpena into an "atomic boot hill". Nuclear generating plants produce three products: 1) electricity, 2) heat, 3) radioactive wastes. Alpena will get only the wastes!

Rather than discuss what might or might not happen I would like to briefly review the established record of radioactive dump sites elsewhere. The most promising proposal has been to bury the hot material in salt mines, similar to the idea for Alpena. After 15 years of study and over \$100 million a site in Kansas was abandoned because it was too near water. The major danger being that the hot wastes (1,000°F) would boil the water and cause the release of steam, water, salt, and radioactive wastes into the air - a radioactive volcano.

The large storage site at Hanford, Washington has leaked over 500,000 gallons of radioactive wastes which are permanently contaminating the soil. Clearly no one knows how to isolate tons of nuclear waste which will remain highly poisonous for thousands of years. Until such methods are developed no community deserves to be used as guinea pigs in such an unforgiving technology.

An additional consideration we shouldn't forget is the transport of these poisons into the area. The tank designs and testing procedures are grossly inadequate according to the U.S. General Accounting Office. They have found at least 64 unreported radioactive contaminations by the wastes. Each cask can hold six times the radioactivity of a Hiroshima-type bomb. Indeed, The Nuclear Regulatory Agency relies upon manufactures to test the safety of their own casks.

The time is here for the people who stand to loose so much insist that this experiment be stopped now. It is not needed, it is not safe, it is not useful, but it is an uncertainty which is not worth endangering us, our children, or the next one hundred generations with increased risks for cancer, birth defects, or Lord knows what else.

Respectfully submitted,

*James M. Corven*

James M. Corven  
Graduate Student, MSU

Mr. CARR. If you could give us a brief summary of your point of view, continue.

**STATEMENT OF JAMES M. CORVEN, GRADUATE STUDENT, MICHIGAN STATE UNIVERSITY**

Mr. CORVEN. I am a doctoral student at Michigan State University. I am a former resident of this area and drove up for this hearing. There are interests that we heard about that are proposing simply an atomic boot hill. Nuclear generating plants produce three products, they produce electricity, heat and they produce waste. They would have Alpena receive only the waste. Additional—I am skipping a great deal—an additional consideration we should not forget is the transportation of these poisons into the area is a concern in itself. The tanks and procedures for testing them are inadequate according to the GAO's own reports. There have been numerous leaks reported repeatedly, 64 not reported from these transportation tanks, both on trucks and on railroads into the area of disposal.

The Nuclear Regulatory Agency relies on the manufacturers to determine the safety of these tests. They do not oversee the manufacture.

I am saying now that the time is here for the people who stand to lose so much, that is the people here, that they insist that this experiment be stopped now. It is not needed, it is not safe, it is not useful, but it is an uncertainty which is not worth endangering us, our children or the next 100 generations with increased risks for cancer, birth defects and Lord knows what else.

Mr. CARR. Thank you very much. I again apologize for our time constraints. We appreciate having your remarks.

The next witness is Mr. Harley Prevost, is that it?

**STATEMENT OF HARLEY PREVOST**

Mr. PREVOST. Thank you, Mr. Chairman.

Mr. CARR. Without objection, the full statement of Mr. Prevost will be printed in the record in full.

[Prepared statement of Harley Prevost follows:]

Gentlemen,

We have been informed by the news media that the Energy Research and Development Administration (E.R.D.A.) intends to put down test holes in the immediate residential and agricultural location of Wilson Township for the purpose of dumping nuclear waste.

In a public meeting held at 8 p.m. Friday, 2 July 1976, at the Wilson Township Hall, 96 people attended and are on record, by signature, in protest of such an endeavor.

The complete text of this statement, presented by the people of Wilson Township, is in direct opposition of such a venture in this or any other township in northeastern Michigan. We, the citizens, are concerned because:

a. There are no positive guarantees against an accident that would cause radiation damage to the lakes, streams, and rivers in our immediate area; and, more particularly, our drinking water which affects our lives.

b. The following was extracted from an article published in 1974, concerning Charlevoix County, Michigan, site of the Big Rock Nuclear Power Plant: (quote) "It has an infant mortality rate of 49% higher than the remainder of the state. The county's immature infant rate is 18% higher. Its leukemia death rate is 400% higher, its cancer death rate is 15% higher and its congenital defect rate 230% higher than the rest of the state." (unquote). These statistics for the period from 1967 to 1971 were given by a Medical Doctor as testimony on low-level radiation effects.

c. This is an agricultural community. As such, the residents are governed by mandatory controls, punishable by law, established to prevent pollution of streams, rivers, etc., by field runoffs--and now our Federal government wants our area for a nuclear waste dump which can destroy, not just pollute.

d. Our local industry spends thousands and thousands of dollars to control air pollution, and, in fact, their operation is in jeopardy at this time--and yet we are asked to accept nuclear waste capable of destroying our very existence. Where is the sanity in this kind of reasoning?

e. As responsible citizens of Wilson Township, we cannot accept the plans for a nuclear waste dumping site, subjecting ourselves and our children to the role of "guinea pigs" in a venture, as yet, not proven completely, 100% safe from radiation damage.

f. If there is no danger in low-level radiation, why does the dentist retreat to a safe place when just x-raying teeth? Why do the x-ray technicians have a safe area when performing their duties? So what happens at a nuclear waste dumping area when an accident happens? Can it be corrected? No, the damage is done and there are no remedies or alternatives for the local citizens.

g. There is no way the citizens of Wilson Township can be given definite assurances that there will be no reasonable chance of intentional or unintentional escape of such nuclear waste.

We, the citizens of Wilson Township, Alpena County, Michigan, in considering the possible dangers involved with a nuclear waste dumping site, insist that E.R.D.A. cease all plans concerning this project. We are prepared to make personal sacrifices in our efforts to stop this project should it be necessary.

Mr. PREVOST. We will cut this down quite a bit, sir.

As responsible citizens of Wilson Township, we cannot accept the plans for a nuclear waste dumping site subjecting ourselves and our children to the role of guinea pigs in a venture as yet not proven completely 100 percent safe from radiation damage.

We, the citizens of Wilson Township, Alpena County, Mich., in considering the possible dangers involved with a nuclear waste dumping site insist that ERDA cease all plans concerning this project. We are prepared to make personal sacrifices in our efforts to stop this project should it be necessary.

Mr. CARR. Thank you very much, Mr. Prevost.

Mr. RUPPE. Thank you very much.

Mr. CARR. Your statement will be placed in the record and made a part of our report.

The last witness is Mr. Bob Scott of Scott Engineering.

#### STATEMENT OF ROBERT SCOTT, SCOTT ENGINEERING

Mr. SCOTT. Thank you, this will be short. I have one paragraph. I am Robert Scott, member of the Loring Shores chapter of the Michigan Society of Professional Engineers. The Loring Shores chapter favors the proposed exploratory studies to be done by ERDA in Alpena County.

In Alpena County, the chapter further wishes to point out that such exploration and study in our opinion will be done by responsible people; that any decisions as to the recommended location of the permanent nuclear waste storage site be made only after such studies have been completed and evaluated.

We think they should find out what the blood is first.

Mr. CARR. Thank you very much, Mr. Scott.

Without objection, the complete statement of Mr. Scott will be placed in the record.

We should note that the statement was signed by Mr. Scott, Mr. John E. Bowen—and you might have to help me on a few names. I am reading from handwritings, Mr. Robert H. A. Allen, Mr. William W. Cruise, Mr. Jack Greise—

Mr. SCOTT. And next is Rebert Alpy, and Tom Hendricks.

Mr. CARR. And Mr. Robert H. Perket?

Mr. SCOTT. Yes.

Mr. CARR. All professional engineers.

[Prepared statement of Robert Scott follows:]



HURON SHORES CHAPTER  
MICHIGAN SOCIETY OF PROFESSIONAL ENGINEERS

July 2, 1976

The Huron Shores Chapter of the National Society of Professional Engineers, a group of local professional engineers, wish to submit the following statement at the NUCLEAR WASTE SITE HEARING, 2:30 p.m., July 6, 1976, Alpena, Michigan.

The Huron Shores Chapter favors the proposed exploratory studies to be done by Energy Research and Development Administration in Alpena County. The Chapter further wishes to point out that such exploration and study, in our opinion, will be done by responsible professional people and that any decisions as to the recommended location of a permanent nuclear waste storage site be made only after such studies have been completed and evaluated.

*Ed S. Scott P.E.*  
*John E. Bowen P.E.*  
*Robert H. Allen P.E.*  
*William W. Cuzio P.E.*  
*Jack L. Hurd P.E.*  
*Robert E. Lacey P.E.*

*Thomas R. Hendricks P.E.*  
*Robert H. Pagetto, P.E.*



Mr. CARR. We thank you all for being here this afternoon. We are again sorry that time—the clock and airlines and all other mechanical means of conveyance conspire to limit our time with you. Thank you for being here.

This meeting stands adjourned—

Mr. RUPPE. Could I take a minute, and I would like to, on behalf of everyone here, express our appreciation to you, Mr. Chairman, for taking time to come up from Lansing outside of your own congressional district and holding these hearings. I am sure we all feel they have been very lengthy, yes, but held in a very fair and excellent fashion and we appreciate your time in being here.

Mr. CARR. Thank you. This hearing is now adjourned.

[Whereupon, at 5:44 p.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]



Mr. [Name] [Title] [Address] [City] [State] [Zip]  
Dear Mr. [Name]:  
I am writing to you regarding the [subject] [matter] [concerning] [the] [company].  
I have reviewed the [documents] [information] [provided] [to] [me] [and] [found] [that] [the] [data] [is] [in] [accordance] [with] [the] [requirements].  
I am pleased to [inform] [you] [that] [the] [process] [is] [moving] [forward] [as] [planned].  
I will [continue] [to] [keep] [you] [updated] [on] [the] [progress].  
If you have any [questions] [or] [concerns], please [do] [not] [hesitate] [to] [contact] [me].  
Thank you for your [time] [and] [cooperation].  
Sincerely,  
[Signature]  
[Name]  
[Title]

