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When nuclear facilities are shut down, cleaning up the remains presents special problems because of radioactivity. Responsibility in this area rests primarily with the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC). ERDA has not given enough attention to its obsolete facilities which have been accumulating. ERDA estimated the cost for decommissioning (disposing of) present excess facilities at \$25 to \$30 million a year for the next 100 years, but there are not sufficient data to support this estimate. NRC has done little to provide guidance for decommissioning commercial nuclear facilities. It does not require owners to cover costs of future decommissioning; costs could have to be assumed by Federal or State governments. Questions that have not been answered by Federal agencies involve: how much it will cost to decommission facilities, who will pay costs, and how many facilities are involved. Other questions which must be answered relate to methods for decommissioning, possible changes in radiation standards, and the future role of nuclear power. Congress should designate one lead Federal agency to approve and monitor overall decommissioning strategy. ERDA should continue research and development efforts, but NRC is uniquely suited for the lead role. (HTW)

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STATEMENT OF  
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BEFORE THE  
SUBCOMMITTEE ON ENVIRONMENT, ENERGY, AND NATURAL RESOURCES  
HOUSE COMMITTEE ON GOVERNMENT OPERATIONS  
ON  
COST FACTORS OF DECOMMISSIONING  
NUCLEAR FACILITIES

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to be here today to discuss our report entitled "Cleaning Up the Remains of Nuclear Facilities--A Multi-Billion Dollar Problem" (EMD-77-46, June 16, 1977). We issued this report on June 16, 1977, in connection with hearings held before the Subcommittee on Atmosphere and Environment, House Committee on Science and Technology.

As with every industry, nuclear facilities and equipment may be shut down, replaced, or become obsolete. Cleaning up the remains of nuclear activities, however, presents special problems because of radioactivity and contamination which often remain and which can endanger public health and safety. Some radioactivity remains hazardous for thousands of years making final and absolute disposal at best a difficult and expensive task. The task is further complicated because of the unknowns involved in understanding the effects of radiological hazards on man. This has led to changing standards for and attitudes on the precautions that should be taken to protect man from radiation.

We first drew attention to these problems in letters we sent to the Administrator, ERDA and the Chairman, NRC, in April and September 1976. In these letters, we pointed out the need to provide assurance that sites decommissioned 20 or 30 years ago no longer pose a threat to public health and safety. Both agencies agreed with the thrust of our letters and advised us of planned or accelerated actions to identify sites and take corrective measures if needed.

Protecting the public from the hazards of radiation lingering at inactive nuclear facilities is a problem which needs Federal attention if a strategy for finding a solution is to be developed. A strategy to clean up these privately and federally owned nuclear facilities, which continue to accumulate, cannot be developed until basic questions on the magnitude of the problem, such as costs, radioactivity and timing, have been answered.

Responsibility for cleaning up inactive nuclear facilities rests primarily with two Federal agencies, with additional help from a third and the 50 States:

--The Energy Research and Development Administration is responsible for disposing of, or decommissioning, the radioactive facilities it owns. In a short time, ownership of these facilities will be passed on to the new Department of Energy.

--The Nuclear Regulatory Commission is responsible for regulating private users of nuclear materials, including powerplants, uranium mills and processors of nuclear fuel.

- The 50 States have traditionally been responsible for controlling the hazards of using accelerators and radium.
- The Environmental Protection Agency has overall responsibility for issuing standards for the protection of the environment from all sources of radiation. But to do this it must have cooperation from the other two agencies identified.

Radiation is encroaching on man's environment. Radiation has become a household word with almost daily news of its dangers. For example, the press and testimony before congressional committees discuss radiation hazards associated with high-level radioactive waste using highly-charged words such as "impossible solutions" and "doomsday issues."

Two types of hazards could be involved in cleaning up a nuclear facility: induced radioactivity and surface contamination. Induced radioactivity results from a nuclear reaction and is embedded in the equipment or material coming into contact with the nuclear reaction. This induced activity can remain dangerous for thousands of years. For this reason, a structure containing induced radioactivity should be dismantled at some point in time before deterioration of the structure begins. This is essential to preclude radioactivity from entering the environment.

Surface contamination results from facilities or equipment coming into contact with radioactive material. As opposed to induced activity, material having surface contamination can often be cleaned up by scrubbing and washing.

In the jargon, the words decontamination and decommissioning are often used in discussions of disposing of nuclear structures. Decontamination

denotes the process of cleaning up surface contamination. Decommissioning is a term used by NRC and ERDA to indicate the closing or shutting down of a facility with some actions taken to prevent--often temporarily-- health and safety problems. It does not necessarily denote a final and absolute solution.

There are various types of nuclear facilities that comprise the decommissioning problem, including reactors, nuclear fuel fabrication facilities, uranium mills, nuclear fuel reprocessing plants, and accelerators.

#### THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

ERDA has not paid enough attention to its facilities that are now obsolete. It has taken temporary action to prevent health and safety problems, but has not dealt with the problem of ultimately disposing of its facilities. These temporary measures which include locking doors, erecting fences and monitoring radiation, have permitted the accumulation of hundreds of facilities which will require further attention. These facilities may not present a radiological hazard now, or perhaps 10 or 20 years from now, but unless final or absolute actions are taken, there is no guarantee that they will not present future radiological hazards.

These facilities continue to accumulate. Reliable estimates have not been made but it seems probable that the cost to decommission federally-owned nuclear facilities will run into billions of dollars. In a memorandum to the Office of Management and Budget, ERDA estimated it would cost \$25 to \$30 million a year for the next 100 years--or a total of \$2.5 to \$3 billion--to decommission just those facilities that are now excess. However, we do not believe this is a credible estimate because:

- ERDA does not have sufficient data to support this estimate;
- ERDA did not have the information necessary to assess the magnitude of the problem posed by its excess facilities when it made this estimate;
- ERDA lacks similar information for its operational facilities;
- an ERDA contractor estimated in 1972 that it could cost as much as \$4 billion to decommission the largest of ERDA's 26 facilities alone (exclusive of waste); and
- ERDA has not developed cost estimates for disposal of 71,000,000 gallons of high level waste it has. The disposal of 600,000 gallons of high level waste at West Valley, New York, has been estimated to cost as much as \$565 million.

Since the issuance of our report, ERDA has (1) completed a computerized system at its Hanford reservation which contains some of the types of information needed to plan its decommissioning task at that site, and (2) instituted an effort to obtain similar information at the remaining 25 reservations. We commend ERDA for its recent efforts.

#### THE NUCLEAR REGULATORY COMMISSION

Almost a quarter of a century has passed since commercial nuclear activities began, and NRC has done relatively little to plan for and to provide guidance for decommissioning commercial nuclear facilities. Studies sponsored by NRC on acceptable alternative methods to decommission are several years from completion. NRC does not require owners of nuclear facilities--except for uranium mills--to develop plans or make financial commitments to cover the cost for future decommissioning. Consequently,

the true cost of nuclear power is not being reflected in the cost to the consumer of nuclear power. Without this financial commitment, the Federal or State Governments can be asked to pay for problems that rightfully should be paid by private industry.

Situations where this has happened, or may, have already arisen. For example, the Federal Government will pay about \$85 million to clean up residues from inoperative uranium mills that were privately owned. Also, as much as \$600 million may be needed to decommission a privately owned nuclear fuel reprocessing plant at West Valley, New York. The State Government is legally responsible for cleaning up the plant but has asked the Federal Government for assistance. In a case at Clinton, Tennessee, the Federal and State Governments shared the cost--approximately \$110,000--to decontaminate a facility that the owners walked away from in 1971. A conference of State officials has recommended that States protect themselves from financial loss should a company not be able to pay to decommission its activities. However, when we issued our report, only seven States required some form of bonding or advance accumulation of funds for decommissioning.

Although cost estimates to decommission private facilities have not been developed by NRC, a recently completed study by a private organization estimated the cost to decommission a commercial nuclear reactor to be as much as \$39 million. No cost data, except for wide-ranging estimates, is available for decommissioning other facilities, such as uranium mills or fuel fabrication plants.

## MAJOR QUESTIONS REMAIN UNANSWERED

Thus far, I have tried to highlight first order questions which, unfortunately, have not been answered by the responsible Federal agencies:

- How much will it cost to decommission nuclear facilities?
- Who will pay these costs?
- How many and what kinds of facilities need or will need to be decommissioned?

There are other important questions which must be answered to develop an acceptable decommissioning strategy.

First, how should commercial power reactors be decommissioned? NRC permits three alternatives for decommissioning a power reactor. Two of these alternatives call for either "entombing" or "mothballing" a reactor and then providing perpetual security, radiological surveys, and maintenance of the facility. These alternatives are questionable because of the perpetual custody feature. The third alternative NRC permits is total dismantlement as soon as the reactor is shut down. A serious disadvantage of this alternative is the radiation hazards to the workers doing the dismantling.

The most feasible approach seems to be a combination wherein the reactor is permitted to "cool down" for 70 to 110 years and is then dismantled.

Another question is will current radiation standards change? There is an historical trend for increased conservatism in radiation standards that guide the decommissioning of facilities. This trend has

lead to safety problems, or at least safety questions, which are expensive to address. For example, both ERDA and NRC are involved in searching for sites of early nuclear projects that had been released for unrestricted use by the general public. Now, because of changed radiation standards and greater caution in dealing with radiological hazards, ERDA is in the process of performing radiological surveys at these sites. As a result of the surveys ERDA had, at the time of our report, identified about 10 sites which would require further effort and remedial actions. If this sort of trend continues, the rules that we now use to govern decommissioning might be considered unsafe years from now.

Lastly, what does the future hold for nuclear power and decommissioning? Until recently, the role of nuclear power as an electrical generating source for the future has been a clear and unchallenged Government policy. Light water reactors, and then breeder reactors with their ability to replenish their own fuel, have been viewed as long-term, almost perpetual, energy sources.

The President is now trying to implement an energy program that would change the future of nuclear power. He has established a policy to (1) defer the U.S. commitment to advanced nuclear technologies that are based on the use of plutonium and (2) use more of the current light water reactors to meet our needs.

Light water reactors require a supply of natural uranium. How much natural uranium exists is a major question that, when answered, dictates the viability of light water reactors as an energy source. Estimates of

U.S. uranium resources range between 1.8 and 3.7 million tons. This amount of natural uranium could fuel about 250 to 500 large light water reactors for 40 years. Sixty-four reactors are now licensed to operate. The number that will be operating in the future is, of course, speculative but estimates for the number expected in the year 2000 range from less than 200 to several hundred more than that.

Obviously, use of light water reactors cannot be expected to continue indefinitely. If another generation of nuclear reactors cannot be developed or is not needed because another energy source, such as solar energy, has been introduced, the end of light water reactors could also be the end of the commercial nuclear power industry.

The possibility of this industry ending raises questions as to whether there will be nuclear-related organizations, nuclear equipment, and individuals expert in the nuclear field that would be capable of dealing with the decommissioning and decontamination problems that could remain for about 100 years after the last reactor is shut down.

#### CONCLUSIONS AND RECOMMENDATIONS

The problems that nuclear-related operations leave behind are increasing because of the expansion of nuclear technologies. ERDA has accumulated a large number of excess facilities which will involve a monumental clean-up effort. ERDA has made headway in compiling the necessary information, but at this time, no overall strategy exists to decommission its facilities. Instead, ERDA relies on a standby strategy that offers temporary public health and protection but that fails to deal with the problem of ultimate disposal.

While elimination of those facilities that are now excess or obsolete is important, it is also important that ERDA begin to consider and plan for decommissioning in all future projects. This requires that decommissioning costs be recognized at the outset of a project.

Similarly, NRC, which has responsibility on the commercial side, has not developed cost estimates, acceptable methods, or standards needed by industry to plan decommissioning or disposal of their facilities. NRC has not paid enough attention to one of the biggest problems that may confront the public in the future--that is, who will pay the cost of decommissioning nuclear power reactors. It has not made any plans or established any requirements for advanced accumulation of funds for decommissioning reactors or any facilities it licenses, with the exception of uranium mills.

We believe the cost of decommissioning should be paid by the current beneficiaries, not by future generations. Just as ERDA should consider decommissioning costs in its projects, private companies have an obligation to accumulate funds for decommissioning during the life of their projects. NRC should make advance planning for decommissioning mandatory at the time of licensing, including provision for funding.

If the States are to maintain their responsibility over selected nuclear activities they must be made aware of the problems with decommissioning and be encouraged to adopt legislation that will assure that proper decommissioning and decontamination is carried out.

The ultimate solution to the decommissioning problem may very well be expensive--but the expense should be known so that it can be planned

for and paid for by the responsible parties. In our report, we make several recommendations to ERDA and NRC aimed at developing the solution to this problem.

Although the task of cleaning up the present problem and preventing future problems will involve a concentrated effort by all those involved, the Federal sector must lead the way and set the example. In the past, the Federal Government has been shortsighted in its approach to solving decommissioning problems. The Federal agencies must now view decommissioning with an eye toward the future, particularly in the areas of financial responsibility, radiation standards, and capability to perform the needed decommissioning tasks.

#### RECOMMENDATIONS TO THE CONGRESS

Because of the magnitude, cost, and time already lost, the Congress should designate one lead Federal agency to approve and monitor an overall decommissioning strategy. ERDA and then the Department of Energy should continue its research and development efforts aimed at finding alternatives for decommissioning and decontamination of nuclear facilities. However, we believe NRC is uniquely suited for the lead role because of its charter to independently regulate commercial nuclear activities to assure public health and safety. This position is consistent with a previous GAO report and testimony wherein we advocated independent assessments by the Commission of certain ERDA operations. In addition, placing this responsibility with the Commission would in our view, add to the credibility of Federal regulation over nuclear energy.

Mr. Chairman, this concludes my prepared statement. We would be glad to answer any questions you may have at this time.