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Environmental Aspects of the
Department of Energy's
Nuclear Defense Activities

Statement of
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Before the
Committee on Governmental Affairs
United States Senate



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Mr. Chairman and Members of the Committee:

We are pleased to be here today to discuss the General Accounting Office's (GAO) work concerning environmental aspects at the Department of Energy's (DOE) nuclear defense facilities. Over the past 2 years, GAO has issued six reports--many prepared at your request, Mr. Chairman--concerning environmental issues and problems within the DOE nuclear defense weapons complex. These reports have identified problems at individual facilities as well as systemic issues facing DOE.

Our major concerns are that DOE's operations (1) have contaminated groundwater and soil with high levels of both radioactive and hazardous substances and (2) do not fully comply with environmental laws. We believe both situations have occurred because DOE has not given sufficient emphasis to environmental protection at its facilities. DOE will have to spend billions of dollars to acquire the necessary environmental permits, change some of its operating and disposal practices, and cleanup existing contamination. We also believe that some of DOE's sites may be irreversibly contaminated and may require long-term institutional control. Finally, DOE has not defined the full scope of its environmental problems, the corrective actions needed, and the costs and time frames to resolve them.

We have recommended that DOE (1) provide the Congress a comprehensive report on its plans, milestones, and cost estimates to bring its facilities into full compliance with applicable environmental laws and (2) develop an overall groundwater and soil

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protection strategy. We believe that once DOE fully implements these recommendations, the Congress and DOE will have a better perspective on the environmental risks and impacts of DOE's operations and of the budgetary implications, and time frames associated with the cleanup activities required. Comprehensive information on environmental problems and an overall groundwater and soil protection strategy would be key components in the overall strategic plan for DOE's nuclear defense complex that Mr. J. Dexter Peach, Assistant Comptroller General, called for in his testimony before this Committee last Thursday (March 12, 1987).

Before I highlight some of the environmental problems we have identified and the actions DOE needs to take to correct them, I will provide you a brief overview of DOE's environmental compliance responsibilities.

DOE'S ENVIRONMENTAL COMPLIANCE

RESPONSIBILITIES

DOE's primary mission is to produce nuclear material (plutonium and tritium) for weapons and naval fuel. This mission is carried out at numerous facilities at 18 sites around the nation--many of which were built more than 30 years ago. DOE's operations routinely use and generate large quantities of a variety of hazardous and radioactive substances. These substances must be handled, transported, and disposed of carefully, not only to prevent worker exposures but also to prevent their release to the environment. Many of the substances contain lethal levels of radiation that must be handled with special equipment.

DOE's policy calls for conducting its operations in an environmentally safe manner. For example, the policy states that its facilities should comply with both radioactive and nonradioactive air emission standards established by the Environmental Protection Agency pursuant to the Clean Air Act. With regard to liquid emissions, DOE regulates itself for the amount and type of radioactive material released but is subject to the Clean Water Act for nonradioactive releases. To do this, DOE's facilities obtain National Pollutant Discharge Elimination System permits from states.

DOE also generates both radioactive and hazardous waste. Until 1984 DOE self-regulated all its waste activities. In 1984, however, a U.S. district court ruled that DOE's hazardous waste was subject to the Resource Conservation and Recovery Act. As a result, DOE must now comply with federal and state regulations in handling and disposing of hazardous waste.

MAJOR ENVIRONMENTAL ISSUES

IDENTIFIED IN GAO REPORTS

Let me briefly summarize our work over the past 2 years that has identified a number of environmental issues and problems at numerous DOE facilities. These reports have resulted in several recommendations.

Information on Three Ohio Defense Facilities (GAO/RCED-86-51FS, November 1985) and Environment and Workers Could Be Better Protected at Ohio Defense Plants (GAO/RCED-86-61, December 1985)

In these reports, prepared at your request, we assessed a number of environmental issues at three DOE plants--Fernald, Mound, and Portsmouth--in Ohio. We found that during the 1970's, DOE considered closing the antiquated Fernald facility. As a result, it did not make capital improvements, and equipment deteriorated. In the early 1980's, DOE's production goals increased, putting a strain on the plant's resources. According to DOE documents, Fernald's management emphasized production over environmental concerns, and between September and December 1984, the plant released about 273 pounds of slightly-enriched uranium into the air. In addition, DOE's inattention to appropriate controls over water runoff from the plant resulted in uranium contamination in three off-site wells, one of which was used for drinking water.

Further, between 1959 and 1969, DOE's Mound facility released large quantities of radioactive tritium into the air and water. In 1970, Mound found tritium contamination in a community drinking water aquifer. At that time, the concentration was within standards, but in 1976 the standards changed, and Mound instituted dilution activities for the aquifer, which are continuing today. Because our work validated previous recommendations that DOE had not adopted, we again made recommendations to DOE concerning radiological monitoring guides and independent verification of contractor data. DOE concurred with our recommendations and expects to have them implemented this year.

Impact of Savannah River Plant's Radioactive Waste Management Practices (GAO/RCED-86-143, July 1986)

This report represented a site-wide assessment of radioactive waste management practices at DOE's Savannah River facility. Although we did not identify any off-site contamination above applicable standards, we found that DOE's operations at that facility have caused extensive on-site groundwater and soil contamination--some of which DOE may never be able to rectify. For example, plant operations have contaminated streams on the plant site; the radioactive contamination in one stream was about 750 times greater than drinking water standards. They have also contaminated groundwater--some concentrations were about 116,000 times greater than drinking water standards. In addition, leaks from high-level waste storage tanks have contaminated about 30,000 square feet of soil underlying the tanks. As a result of the contamination at the facility, the possibility exists that some radioactive contamination could reach the Tuscaloosa aquifer. In addition, because of the extensive contamination, institutional controls and oversight at the facility may be needed for hundreds of years.

Environmental Issues at DOE's Nuclear Defense Facilities (GAO/RCED-86-192, September 1986)

This report examined environmental conditions at nine DOE facilities nationwide and found that groundwater and soil have been contaminated at most of these facilities. At eight facilities, the groundwater has been contaminated to high levels with hazardous

and/or radioactive material (attachment I). For example, DOE facilities in Colorado, South Carolina, and Tennessee contaminated the groundwater with solvents (cleaning agents) that are as much as 1,000 times above proposed drinking water standards. Other DOE facilities in South Carolina and Washington State contaminated the groundwater with radioactive materials that are more than 400 times greater than drinking water standards. At Mound and Fernald in Ohio, the contamination has migrated off-site into drinking water supplies--both a well and an aquifer. In addition, DOE's Savannah River operations have contaminated a drinking water aquifer underlying the site. State officials are concerned that the existing contamination may pose a public health threat and that DOE is adding to the contamination by continuing to discharge radioactive and hazardous material into the environment.

DOE's operations had also contaminated soil at six facilities (attachment II). At some sites--the Y-12 plant in Oak Ridge, Tennessee, Mound and Fernald in Ohio, and Rocky Flats in Colorado--the contamination had migrated off-site. Of the off-site contamination problems, the Y-12 plant poses a significant public health threat. Mercury from that plant's operations contaminated a stream bed and a flood plain. In some locations, the contamination is greater than 2,000 times background levels and over 150 times greater than the state's public health guidelines. To make matters worse, contaminated soil from the flood plain was used in various construction projects around the town of Oak Ridge. In addition,

off-site plutonium contamination of the soil at Mound may endanger public health if it is disturbed.

Although DOE has projects underway to clean up both the groundwater and soil contamination at a few facilities, it continues to study the extent, type, and movement of the contamination at other facilities. However, these problems have existed for many years--some for as long as 20 years. Therefore, we recommended that DOE develop an overall groundwater and soil protection strategy to provide the Congress and the public a better perspective on the environmental risks associated with DOE's facilities.

We also found that four DOE facilities are not in full compliance with the Clean Water Act. For example, in 1980 the state required DOE to construct four new projects at the Fernald, Ohio, plant in order to meet Clean Water Act requirements. As of March 1987, one of these projects had not been completed. In addition, DOE believes that one project may not adequately treat the waste in the manner originally anticipated, thus DOE may have to take additional actions to bring Fernald into full compliance with the Clean Water Act.

With regard to the Resource Conservation and Recovery Act, we noted that none of the nine facilities has received a final permit. This act requires that waste be appropriately protected, from generation through its ultimate disposal, primarily to prevent groundwater contamination. Until DOE's facilities receive the required permits, which could take many years, they continue to

dispose of waste in a manner that may add to groundwater contamination. As a result, we recommended that DOE develop a comprehensive plan that sets out its plans, milestones, and cost estimates to bring its facilities into full compliance with applicable environmental laws and provide the Congress and public assurance that the waste will be disposed of in an environmentally acceptable manner. We also recommended that DOE allow outside, independent inspection of the disposal practices used for any waste DOE self-regulates.

Unresolved Issues Concerning Hanford's Waste Management Practices
(GAO/RCED-87-30, November 1986)

We found that DOE's Hanford, Washington, facility discharged liquid waste directly into the soil, although federal and state regulators would not allow private entities to do this without protective liners and proper monitoring. For example, in 1985, Hanford disposed of over 25 million gallons of contaminated (both radioactive and hazardous) waste to an unlined disposal site and did not meet groundwater monitoring requirements for the site. Hanford instituted changes in July 1986 to reduce the level of contamination in the waste discharged and plans further changes--expected to be in place by 1989--to its operations to lessen the problem. Until this system is in place, Hanford could continue to discharge contaminated waste into the soil in a manner that may not comply with environmental laws.

We also found that Hanford had been slow to identify all units that should be regulated under the Resource Conservation and

Recovery Act, and it has not identified all potential Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") sites that may require corrective actions. As a result, Hanford does not know, nor can it ensure the regulatory agencies, that it manages and disposes of waste in compliance with these environmental waste statutes. Therefore, we recommended that DOE identify all current and previously-used waste treatment, storage, and disposal sites, and the corrective actions required for each. DOE concurred with this recommendation and expects to complete this effort by August 1987.

DOE's Transuranic Waste Disposal Plan Needs Revision (GAO/RCED-86-90, March 1986)

In this report, we discussed the disposal of transuranic waste that DOE generates at many facilities across the country. Transuranic waste--discarded tools, rags, and paper, containing man-made radioactive elements--remains dangerous for thousands of years and presents a health hazard if inhaled, ingested, or absorbed into the body through an open wound. Although DOE has a multi-billion dollar effort to put this waste 2,150 feet underground in a geological repository in New Mexico, it only expects to send about 19 percent of the existing waste there. DOE has made no commitment regarding the permanent disposal of the remaining 81 percent that is currently at six locations around the country. Since this waste is only a few feet underground (25 feet below the surface at most), it can pose environmental and/or health problems if it is disturbed or if it migrates. If DOE ultimately

decides to keep this waste in place, it may have to institute remedial actions to immobilize the waste to ensure it does not migrate to the groundwater and/or contaminate adjacent soil. Since DOE has not addressed these issues, we recommended that it provide the Congress with complete information on its plans and costs to permanently dispose of this waste. DOE concurred with the recommendation and expects to complete a report on these issues by June 1987.

FUTURE COSTS UNCERTAIN BUT

WILL BE IN THE BILLIONS

The cost of dealing with environmental problems at DOE facilities will be substantial. Because so many uncertainties exist--DOE has not fully identified its problems and/or the solutions to correct them--the total cost estimates to address the environmental concerns are not known. However, it will take billions of dollars for DOE to comply with environmental laws. In addition, DOE plans to spend billions of dollars to dispose of high-level and transuranic waste in geologic repositories. To provide a perspective of some identified costs to date, we have summarized some examples from our previously issued reports.

At three facilities we reviewed (Fernald and Mound in Ohio and Y-12 in Tennessee), DOE plans to spend over \$60 million to bring them into compliance with the Clean Water Act. In addition, to get final Resource Conservation and Recovery Act permits for nine facilities, DOE plans to change its disposal operations at an estimated cost of \$200 million.

The eventual cost for corrective actions at all of DOE's facilities will be much higher, depending on the site-specific environmental problems that DOE will have to resolve. For example, DOE is studying ways to reduce, eliminate, or recycle low-level radioactive liquid waste rather than discharge it directly into the soil. One study conducted at Hanford estimates that alternative disposal methods could cost up to \$500 million. Further, groundwater cleanup and monitoring costs can easily amount to hundreds of millions of dollars at a single site. In addition, DOE may have to modify existing facilities to meet requirements under the Clean Water Act. For example, it is examining alternatives to reduce the temperature of the water discharged from the N-reactor. One alternative is estimated to cost \$150 million.

With regard to radioactive waste disposal, DOE expects to spend over \$4.6 billion to dispose of about 19 percent of its transuranic waste in a geologic repository. DOE officials could not provide cost estimates for the permanent disposal of the remaining 81 percent but believe the costs could be substantial, depending on the disposal method selected. In addition, DOE estimates it will cost from \$491 million to \$6.4 billion (depending on the method selected) to dispose of high-level radioactive waste from 149 single-walled tanks at Hanford.

In summary, although a complete estimate is not available, the eventual cost to bring the DOE facilities into full compliance with environmental laws and to dispose of waste will clearly be in the billions of dollars.

SUMMARY

In testimony given last Thursday, Mr. J. Dexter Peach called for an overall strategic plan for the entire DOE nuclear defense complex that sets forth the following: projected facility requirements for continued nuclear weapons production; a comprehensive picture of the environmental, safety, and health issues facing DOE; and solutions to resolve them. In my testimony today, I am reiterating the need for two environmental actions that we have previously recommended to DOE. These items would be an integral part of this overall strategic plan. They are (1) an overall groundwater and soil protection strategy and (2) a comprehensive plan to bring DOE facilities into full compliance with environmental laws.

DOE has accepted these recommendations, but we do not know when they will be fully implemented. I hope that the Committee has the opportunity to explore with DOE officials at these hearings when our recommendations will be fully implemented. Only then will the Congress and the public have a clear understanding of the environmental risks associated with operating DOE's nuclear defense activities.

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This concludes my testimony. We would be pleased to respond to any questions you or Members of the Committee may have.

**Groundwater Contamination
at Selected DOE Facilities^a**

Facility	Major type(s) of contamination	Level of contamination
Feed Materials Production Center, Ohio	nitrate and chloride	Nitrates and chloride have been reported above drinking water standards.
Fuel fabrication plant, South Carolina	solvents ^b and nitrates	Solvents have been reported at levels over 30,000 times the proposed drinking water standards. Nitrates have been reported at levels over 10 times the drinking water standards.
Los Alamos National Laboratory, New Mexico	none ^c	No contaminants resulting from the laboratory's operations have been reported that exceed drinking water standards.
Mound Laboratory, Ohio	tritium ^d	Although in 1976 tritium concentrations were above the drinking water standards, continual remedial actions keep the levels below the standards.
N-Reactor, Washington State	strontium-90, ^e tritium, and nitrates	Strontium-90 has been detected at levels over 400 times higher than the drinking water standards. Tritium and nitrates are slightly above drinking water standards.
Rocky Flats plant, Colorado	solvents, cadmium, and selenium	Solvents have been reported as high as 1,000 times the proposed drinking water standards. Cadmium and selenium have been detected at or slightly above the drinking water standards.
Reprocessing plant, South Carolina	tritium, nitrates, and mercury	Tritium has been reported over 2,500 times the drinking water standards. Nitrates and mercury have been detected at levels slightly above drinking water standards.
Reprocessing plant, Washington State	tritium, iodine-129, ^f and nitrates	Tritium concentrations have been reported over 25 times higher than the drinking water standards. Iodine-129 and nitrates have both been reported above the drinking water standards.
Y-12 plant, Tennessee	Solvents, nitrates, mercury, arsenic, and chromium	Solvents have been detected over 1,000 times greater than proposed drinking water standards. Nitrate concentrations have been reported at levels 1,000 times the drinking water standards. Mercury has been detected at levels 500 times the drinking water standards. Arsenic has been detected at levels 60 times the drinking water standards. Chromium has been detected at levels over 30 times the drinking water standards.

^aThe table shows only major contaminants (e.g., those that exceed existing and/or proposed drinking water standards). At many facilities other contaminants are in the groundwater above background levels.

^bSolvents are cleaning agents, such as trichloroethylene, 1,1,1, trichloroethane, and/or tetrachloroethylene. These are classified as hazardous waste and toxic pollutants.

^cAccording to DOE, at this facility arsenic and fluoride occur naturally in the groundwater.

^dTritium is a radioactive isotope of hydrogen. It has a half-life of 12.5 years.

^eStrontium-90 is a radioactive isotope of strontium with a half-life of 30 years.

^fIodine-129 is a radioactive isotope of iodine with a half-life of over 15 million years.

**Soil Contamination at
Selected DOE Facilities**

Facility	Description of unplanned soil contamination
Feed Materials Production Center, Ohio	Elevated levels of uranium both on- and off-site. Data indicate that elevated levels are, in some places, more than 10 times background levels.
Mound Laboratory, Ohio	Elevated levels of plutonium both on- and off-site. Data indicate that the levels are, in some instances, more than 100 times background levels.
Rocky Flats plant, Colorado	Elevated levels of plutonium both on- and off-site. Data indicate that the levels are, in some places, more than 50 times background levels.
Reprocessing plant, South Carolina	Elevated levels of plutonium on-site. Levels recorded were slightly higher than 10 times background levels. Soil under a high-level waste tank has become radioactive.
Reprocessing plant, Washington State	Soil under some high-level waste tanks has become radioactive.
Y-12 plant, Tennessee	Off-site mercury contamination greater than 2,000 times background levels has been recorded.