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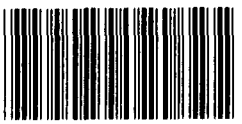
Energy Issues



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GAO **United States**
General Accounting Office
Washington, D.C. 20548

Comptroller General
of the United States

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The Speaker of the House of Representatives
The Majority Leader of the Senate

In response to your request, this transition series report discusses major policy, management, and program issues facing the Congress and the new administration in the areas of energy and science. The issues include (1) reflecting trade-offs in energy policy, (2) revising strategies for the nuclear weapons complex, (3) refocusing national laboratories on current national needs, (4) developing a long-term management focus at the Department of Energy (DOE), (5) resolving DOE's nuclear waste disposal dilemma, and (6) strengthening international nuclear safety and nonproliferation.

As part of our high-risk series on program areas vulnerable to waste, fraud, abuse, and mismanagement, we are issuing a related report, Department of Energy Contract Management (GAO/HR-93-9, Dec. 1992).

The GAO products on which this transition series report is based are listed at the end of the report.

We are also sending copies of this report to the President-elect, the Republican leadership of the Congress, the appropriate congressional committees, and the Secretary-designate of Energy.

Charles A. Bowsher

Charles A. Bowsher

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Energy Issues

In 1991, the Persian Gulf War focused the nation's attention on the need for a long-term energy policy. Subsequently, the Congress enacted the most comprehensive energy legislation in over a decade—the Energy Policy Act of 1992. These events, together with the end of the Cold War and a consequent reduction in the demand for nuclear weapons, provide the opportunity to fundamentally reexamine the Department of Energy's (DOE) missions.

Dealing with the problems of DOE's nuclear weapons complex presents monumental challenges that will require enormous amounts of resources. The agency has begun a massive $160 billion cleanup of the legacy of 40 years of environmental abuse at weapons facilities and will need billions of dollars more to reconfigure the aging complex once it decides how and where future weapons materials can best be produced. DOE's national laboratories—some of which support the weapons program—are funded at more than $7 billion and employ over 50,000 staff; however, the agency has yet to decide the optimal future role of the laboratories and the appropriate distribution of research and development dollars in a deficit-constrained fiscal environment.

DOE has initiated sweeping organizational and management changes in response to the issues we identified 4 years ago. Responding to calls for increased oversight of the agency's many contractors—including those that operate the national laboratories and nuclear weapons facilities—DOE has also taken steps to reform its management philosophy and practices and to give contractors more incentive to act responsibly. However, DOE is still coping with the legacy of its Cold War mission and reliance on contractors; completing these changes will take time and significant leadership effort.

DOE's planned nuclear waste repository, estimated to cost up to $30 billion, appears as distant as it did when authorized a decade ago. Meanwhile, the specter of a nuclear black market accompanying the dismantling of thousands of weapons in the United States and abroad, together with the need to repair or replace potentially unsafe nuclear power plants in Eastern Europe and the former Soviet Union—at a cost of up to $50 billion—demand attention to international nuclear safety.

Reflecting Trade-Offs in Energy Policy

The United States currently relies on fossil fuels—coal, natural gas, and petroleum—to supply some 85 percent of its energy requirements. This reliance, which has evolved in response to market forces, entails economic, national security, and environmental costs. Policies that would better reflect these societal costs in energy prices could help enhance national security, foster energy efficiency, and improve our environment.

Market Forces Directing Energy Choices

Petroleum supplies about 40 percent of the nation's energy needs, and, as we noted in our 1988 transition report, the transportation sector is almost totally oil-dependent. Nearly half of the petroleum is imported. Even with the efforts initiated or continued by the Energy Policy Act of 1992, the percentage of oil needs met by imports is projected to increase, as is the portion of imports originating in volatile Middle Eastern countries.

A major reason for our reliance on oil is its relatively low price. For example, the price of gasoline in the United States, when adjusted for inflation, is lower now than in 1947. This makes it difficult for alternative motor fuels to compete and discourages

measures that increase vehicle fuel efficiency.

Similarly, some 70 percent of the nation's electricity is generated using fossil fuels—primarily coal and, increasingly, natural gas. The use of fossil fuels for generating electricity is dictated by price; with some exceptions, alternatives such as solar, wind, or geothermal energy are too expensive compared with fossil fuels. As in the transportation sector, relatively low fossil fuel prices can discourage large-scale development of alternatives and limit efforts to conserve electricity.

Market Forces Possibly Not Reflecting All Costs

The extent to which market prices reflect the societal costs of energy sources—including dependence on foreign suppliers and environmental impacts—varies and is debated among economists and policy advisors. The Council of Economic Advisors reported in 1991, for example, that national security and environmental considerations are given inadequate weight by the market forces that determine energy prices.

In addition to security concerns raised by a dependence on foreign sources, a lack of

alternatives to oil makes the nation economically vulnerable. For example, between August 1 and December 1, 1990, U.S. consumers spent $21 billion more for crude oil and petroleum products than they would have spent if the Middle East crisis had not occurred; of that amount, $8 billion was paid to foreign producers. In addition, oil combustion creates significant environmental effects. Motor vehicles generate a large portion of hydrocarbon and carbon monoxide emissions in our cities and are in large part responsible for the failure of many metropolitan areas to meet air quality standards in 1991.

Policymakers Facing Options

Some existing policies and programs encourage the development of alternatives to fossil fuels, such as solar and wind energy technologies and alternative motor vehicle fuels. However, an additional number of market incentives, regulatory and tax policies, and research and development strategies have the potential to make energy prices better reflect societal costs and promote realistic efforts to develop alternative energy sources.

Reversing current trends towards increased reliance on fossil fuels, particularly oil, will

take further steps. Higher gasoline taxes, tailpipe emissions taxes, subsidies for alternative fuels, and higher fuel economy standards are examples of options that could be used in the transportation sector. Our analysis of these and other options shows that each involves trade-offs, but they can be modified or combined so as to mitigate any adverse impact and increase their effectiveness. For example, revenues from a higher gasoline tax or a tailpipe emissions tax could be used to reduce other taxes, such as taxes on income, and possibly offset negative effects on economic growth and on low-income and rural groups.

Revising Weapons Complex Strategies in Response to Changing Events

The collapse of the Soviet Union and devastating environmental contamination and safety problems throughout the nuclear weapons complex have shifted DOE's major mission from nuclear weapons production to environmental restoration and waste management. Virtually overnight, DOE's plans for modernizing the weapons complex have become outdated, and a refocusing of cleanup priorities in the face of our nation's budget deficit is critical.

Reconfiguring the Complex

DOE's 1988 plan to modernize its 10-facility nuclear weapons complex at an estimated cost of about $50 billion was completed before the recent historic agreements to dramatically cut our nuclear weapons stockpile. The basic challenge now is to determine what our nuclear weapons production capability should be in the future, how best to reconfigure the complex in light of a changing world, how to dismantle large numbers of nuclear weapons, and how to dispose of, store, or use plutonium and other material from retired weapons.

DOE has not yet come to grips with such issues and has been slow to react to the reduced need for nuclear weapons. For

example, in a February 1991 report, we questioned the validity of DOE's plan for modernizing the weapons complex—specifically, the need for a new tritium production facility—in light of the decreasing weapons inventory and the availability of tritium from other sources. DOE finally terminated its plans for the facility—thus saving billions of dollars—in September 1992. A better understanding of the future role of the weapons complex may provide further opportunities to streamline the complex and realize greater savings.

Critical decisions are also necessary to guide the dismantling of nuclear weapons and the disposition of weapons-grade material. DOE will have to dismantle thousands of its nuclear weapons over the next several years, but the safe dismantling of so many weapons could tax the limited capabilities of DOE's current facilities. Furthermore, dismantling will create a significant inventory of weapons-grade plutonium and enriched uranium. These materials must be carefully safeguarded and stored to prevent both proliferation and accidental releases. The future disposition of this material remains unclear.

Responding to Environmental Problems

DOE faces a monumental task in addressing the legacy of environmental contamination created by nearly a half century of nuclear weapons production. The cost to clean up the complex continues to grow. In our 1988 transition report, we estimated that costs could range from $100 to $130 billion. Long-term estimates are now up to at least $160 billion—and may go higher—with annual expenditures of over $8 billion by fiscal year 1998. Also, the cleanup is likely to take longer than the 30 years that DOE originally estimated.

To demonstrate its willingness to resolve its environmental problems, DOE has signed over 80 compliance agreements with the Environmental Protection Agency and states, most of them over the past few years. However, DOE did so in some cases without knowing the costs of the cleanup or having the technologies needed to deal with a variety of cleanup problems. Escalating costs and technological uncertainties are now forcing DOE to renegotiate some of these agreements. These circumstances as well as competing national budget priorities raise broader cleanup issues—such as which sites should be cleaned up, in what order, and to what standard.

Refocusing DOE's Laboratories to Meet Current National Needs

For the past 45 years, DOE's national laboratories have spent billions of dollars building the nation's nuclear arsenal and conducting research in basic science and energy technologies. Funded at over $7 billion and staffed with over 50,000 scientific and other personnel, DOE's nine multiprogram laboratories constitute a valuable national resource. Today, the laboratories face increasing pressures to reorient their work towards more immediate national needs.

Changing Laboratory Missions

The dramatic reduction in the arms race, brought about by the collapse of the Soviet Union, has raised serious questions about the future role and structure of the three large laboratories devoted primarily to designing nuclear weapons. Furthermore, all of the laboratories face increasing pressure to direct their talented staffs and facilities to address current national priorities, such as improving the nation's economic competitiveness, cleaning up the environment, and developing U.S. infrastructure. In an era of growing national budget deficits, the laboratories can no longer assume that basic research—although highly regarded within the scientific community—will be funded at previous

levels without more evidence of useful applications.

Both DOE and its laboratories have begun taking steps to address this situation. The laboratories already conduct research in areas potentially useful to industry, such as high-performance computing, materials research, and nuclear medicine. DOE has developed new mechanisms to encourage cooperation between the laboratories and industry. However, others from outside the research community question whether this transition is worthwhile or can be successful and have suggested reassessing the need for facilities that have accomplished their missions.

All of these factors increase the pressure on DOE to outline future directions for its laboratories as well as to improve day-to-day program management. However, DOE's complicated management structure—through which laboratories report to different field offices and assistant secretaries—makes both mission direction and laboratory management difficult. Indeed, many fear that the current system may lead to gridlock at the laboratories. DOE's own advisory board describes a "loss of coherence and focus" in the laboratories that

is impairing their ability to respond to new initiatives.

Deciding which national needs the laboratories can best address is the starting point. Then, it will be necessary to reorient the laboratories in this direction. As the focus of the laboratories changes, a framework must be developed that encourages the laboratories and industry to work together in planning research efforts.

Developing a Long-Term Management Focus

Despite corrective efforts, DOE still faces long-standing management and contracting problems, which have placed the government's multibillion-dollar annual investment in DOE's activities at risk. For example, management of the nuclear weapons complex has been characterized by years of neglect of environmental, safety, and health issues. Correcting problems like these requires a sustained commitment to overcoming ingrained institutional problems.

Sustained Commitment Needed to Improve Management

Contract management weaknesses can be traced to DOE's traditional "least interference" management style stemming from the Manhattan Project of World War II. DOE gave its contractors virtual independence in managing nuclear weapons facilities and did not develop effective information systems to monitor contractors' performance.

As discussed in our high-risk series report on DOE contract management, the arm's-length approach begun then has continued for both the nuclear weapons complex and the national laboratories, creating serious problems. For example, our work has identified excessive subcontracting costs, missing classified documents, contractors'

funding of unauthorized projects, and contract clauses requiring DOE to reimburse contractors for irregular costs, such as thefts by contractor employees. DOE's failure to systematically monitor contractors' financial reporting practices has also created an atmosphere conducive to financial irregularities.

DOE has recognized its management and contracting problems and has taken many positive steps. To remedy problems caused by a fragmented structure, DOE in 1989 realigned organizational relationships to build better accountability into field and headquarters operations. DOE has also begun to revise its contract management philosophy to strengthen contractor oversight and accountability. More than 80 percent of DOE's 1991 $19 billion procurement budget went to contractors that carry out the Department's primary functions.

However, the success of the reorganization is being hampered by continuing uncertainty about new roles and responsibilities for the field managers who oversee contractors. Furthermore, poor coordination of guidance and direction on program and policy matters is making communication between

headquarters and field staff difficult and sometimes nonproductive. As a result, decision-making is delayed and clear priorities are not set for a wide range of issues.

DOE's management problems have developed over 40 or 50 years, and their solutions must also be measured over the long term. Actions taken to date are broad policy initiatives that will require years to implement. Sustained commitment to change is needed to institutionalize improvements.

Resolving DOE's Nuclear Waste Disposal Dilemma

Although a decade has passed since the Congress established a program for disposing of nuclear waste from electric utilities and several billion dollars have been invested, siting a nuclear waste repository seems as distant as it did 10 years ago.

Missed Time Frames and Escalating Costs

The Congress' original goal of having a repository in place by 1998 to accept spent (used) fuel from civilian nuclear utilities will not be met. DOE now has a target date of 2010, provided that the Yucca Mountain, Nevada, site that it is investigating is found to be suitable. However, completing the repository by that date appears unlikely because DOE has not been requesting the funds that it estimates will be needed to meet that schedule.

The cost of the waste disposal program—estimated at nearly $30 billion in today's dollars—is also being questioned. DOE has already spent over $3 billion on the program, including more than $1 billion over the last 10 years to study Yucca Mountain. DOE estimates that it will cost almost $5 billion more to complete planned site investigation activities by 2001, a deadline that it must meet to have any chance of meeting its target date for opening the

repository. To meet this time frame, DOE must successfully ramp up its investigation program almost immediately to more than twice its current scope.

Also, according to the review board that evaluates the technical and scientific validity of DOE's program, DOE may not have allowed enough time to address and resolve technical issues that could significantly affect the performance and cost of the repository.

Nonetheless, utilities believe that DOE has a binding commitment to begin accepting their waste in 1998. This question may require resolution by the courts. In the meantime, some utilities are finding it necessary to develop new spent fuel storage capacity at their nuclear plants. Although DOE plans to develop a temporary storage facility by 1998, it is having difficulty identifying a host site.

DOE is currently relying on the nuclear waste negotiator, an independent federal official, to find a state or Indian tribe willing to host a temporary storage facility. Although discussions are continuing, it is uncertain whether any state or tribe will agree in time for a facility to begin accepting waste by 1998.

In view of the dim prospects for completing a repository by 2010 and the uncertain availability of a temporary storage facility, a reassessment is needed. It is time to reconsider the alternatives for storing nuclear waste and to ensure that funding levels and time frames realistically accord with the selected alternative(s).

Strengthening International Nuclear Safety and Nonproliferation

Many of the 40 aging nuclear power plants of Soviet design operating in the former Soviet Union and Eastern Europe are viewed as too dangerous to operate over the long term and have the potential to create a Chernobyl-like accident. Furthermore, the breakup of the Soviet Union into independent states may have compromised control of nuclear materials and technologies.

Addressing Safety Concerns

Up to $50 billion may be needed to refurbish, repair, and replace nuclear reactors in the former Soviet Union and Eastern Europe. How to address this problem, including deciding whether some of the reactors should be shut down permanently, is a matter of debate. In addition, as we reported in November 1991, no international consensus or agreement exists on how to improve nuclear power reactor safety. A major question is whether binding international nuclear safety standards or some other common measures are needed to judge the safety of nuclear power reactors around the world.

DOE, along with other U.S. agencies, is seeking to enhance the safety of international nuclear power reactors by providing technical training courses,

equipment, and cost-free expert advice. DOE and others face the challenge of coordinating this assistance and reaching agreement on future needs for assistance.

Furthermore, member states of the International Atomic Energy Agency, including the United States, are currently working on a nuclear safety convention. U.S. policymakers will need to determine how guidelines or standards can best be implemented and enforced.

Addressing Nonproliferation Concerns

The discovery of Iraq's clandestine nuclear weapons program along with fears about the dispersion of nuclear weapons from the former Soviet Union has focused world concern on the importance of safeguarding nuclear materials and technology. Dismantling thousands of Soviet nuclear warheads will require the safeguarding of tons of plutonium and highly enriched uranium to prevent the emergence of a nuclear black market.

DOE is one of several federal agencies, including the Departments of State and Defense, the Nuclear Regulatory Commission, and the Arms Control and Disarmament Agency, that conduct

nonproliferation programs and activities. Among other things, DOE provides research and development support for safeguard activities, such as enhancing inspection capabilities and developing permanent disposal facilities.

DOE, in conjunction with other U.S. agencies, is negotiating a recent U.S. proposal to provide up to $800 million in aid to the former Soviet Union to dismantle and destroy nuclear weapons. DOE's expertise in materials and in the conversion of plutonium and highly enriched uranium into proliferation-resistant forms will be needed to help ensure that components from these weapons cannot be used again to make nuclear weapons. The United States has also pledged to buy 500 tons of highly enriched uranium from Russia to prevent its sale to other countries.

Proliferation of nuclear materials could have grave consequences, which the United States and other nations must address. The International Atomic Energy Agency's system to safeguard nuclear materials and technologies may be adversely affected by financial constraints, including the possible inability of a number of countries to provide their share of the financing. Among many

other questions, policymakers must determine what resources the United States and other nations need to commit to maintain the integrity and reliability of this multinational system.

Related GAO Products

Energy Policy

Energy Policy: Options to Reduce Environmental and Other Costs of Gasoline Consumption (GAO/RCED-92-260, Sept. 17, 1992).

Energy Policy: Developing Strategies for Energy Policies in the 1990s (GAO/RCED-90-85, June 19, 1990).

Energy Issues (GAO/OCG-89-16TR, Nov. 1988).

DOE Management

Department of Energy Contract Management (GAO/HR-93-9, Dec. 1992).

Department of Energy: Better Information Resources Management Needed to Accomplish Missions (GAO/IMTEC-92-53, Sept. 29, 1992).

Energy Management: Vulnerability of DOE's Contracting to Waste, Fraud, Abuse, and Mismanagement (GAO/RCED-92-101, Apr. 10, 1992).

Energy Management: Tightening Fee Process and Contractor Accountability Will Challenge DOE (GAO/RCED-92-9, Oct. 30, 1991).

Energy Management: DOE Actions to Improve Oversight of Contractors' Subcontracting Practices (GAO/RCED-92-28, Oct. 7, 1991).

Nuclear Weapons Complex

Nuclear Waste: Defense Waste Processing Facility—Cost, Schedule, and Technical Issues (GAO/RCED-92-183, June 17, 1992).

Cleanup Technology: Better Management for DOE's Technology Development Program (GAO/RCED-92-145, Apr. 10, 1992).

Nuclear Weapons Complex: Major Safety, Environmental, and Reconfiguration Issues Facing DOE (GAO/T-RCED-92-31, Feb. 25, 1992).

Nuclear Waste: Pretreatment Modifications at DOE Hanford's B Plant Should Be Stopped (GAO/RCED-91-165, June 12, 1991).

Nuclear Materials: Decreasing Tritium Requirements and Their Effect on DOE Programs (GAO/RCED-91-100, Feb. 8, 1991).

National Laboratories

Nuclear Weapons Complex: Issues Surrounding Consolidating Los Alamos and Lawrence Livermore National Laboratories (GAO/T-RCED-92-98, Sept. 24, 1992).

Nuclear Waste

Nuclear Waste: DOE's Repository Site Investigations, A Long and Difficult Task (GAO/RCED-92-73, May 27, 1992).

Nuclear Waste: Operation of Monitored Retrievable Storage Facility Is Unlikely by 1998 (GAO/RCED-91-194, Sept. 24, 1991).

International Nuclear Safety

Nuclear Safety: Concerns About the Nuclear Power Reactors in Cuba (GAO/RCED-92-262, Sept. 24, 1992).

Nuclear Power Safety: Chernobyl Accident Prompted Worldwide Actions but Further Efforts Needed (GAO/NSIAD-92-28, Nov. 4, 1991).

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