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Report to Congressional Requesters

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NUCLEAR WASTE

Change in Test Strategy Sound, but DOE Overstated Savings

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Congressional Requesters

After pursuing, for a decade, a strategy for underground tests with nuclear wastes in the Waste Isolation Pilot Plant (WIPP)—a proposed repository for the disposal of transuranic wastes located near Carlsbad, New Mexico—the Department of Energy (DOE) announced in October 1993 that it was abandoning these tests in favor of laboratory-based tests.[1] By making this change, DOE claimed it would save about $139 million by January 2000 and begin disposing of the wastes 2 years earlier than that date. Accordingly, you asked us to determine (1) if DOE's decision was scientifically sound and (2) if DOE's projected cost and time savings were realistic. You also asked us to assess the current outlook for DOE's satisfying all remaining technical and regulatory requirements. As agreed with your offices, we addressed the first two issues in this report. Because DOE had not completed its analysis of WIPP's fiscal year 1995 budget at the time of our review, we will address the third issue in a subsequent report.

Results in Brief

The general consensus among scientists, experts, regulators, and others interested in WIPP is that DOE's decision to discontinue its planned underground tests with transuranic wastes is sound. In spite of numerous revisions to the planned tests, key scientific, regulatory, and oversight groups continued to identify technical and operational concerns with the tests. For example, the Environmental Protection Agency (EPA) questioned whether the tests would yield information that was directly relevant to demonstrating compliance with the agency's disposal standards. Furthermore, with no regulatory, operational, or scientific imperative for conducting underground tests, many scientists, experts, regulatory bodies, and interested groups support replacing the tests with laboratory tests that appear to be scientifically viable and can be more safely controlled.

Although DOE's decision to abandon the underground tests is considered to be sound, the Department's projected cost savings are not justified for two reasons. First, DOE said it would save $88 million by deferring annual payments of impact assistance to New Mexico from 1994, when DOE had planned to begin waste tests in WIPP, to 1998, when DOE now plans to

[1]Transuranic wastes are certain nuclear wastes from the nation's nuclear defense program, such as tools, paper, and rags, that are contaminated with long-lived, radioactive elements having atomic numbers higher than uranium.

receive the first waste at the facility.[2] Because DOE will eventually make these payments, the actual savings would be limited to the gain to the government from DOE's making the payments 4 years later than DOE otherwise would have; we estimate that the savings would be between $27 million and $32 million. Second, DOE lacked adequate support for other elements of the estimated cost savings. Documentation for many cost elements was either incomplete or inconsistent.

Two other factors also raise questions about the savings DOE projected from its decision to substitute laboratory-based tests for underground tests. First, DOE had already concluded that budget constraints would probably preclude it from requesting additional funds that it considered essential for improving the underground tests. Thus, it is questionable if DOE could "save" funds that it did not expect to request and receive. Second, DOE may incur new costs for initiatives in the Carlsbad area related to the Department's decision to cancel the underground tests.

Finally, DOE will not achieve its new objective of opening WIPP by January 1998 instead of January 2000. In fact, before DOE's October 1993 announcement, a senior manager had informed the Secretary of Energy that disposal operations could "possibly" begin in 1998 but, assuming no litigation, would "likely" begin in 2000. Moreover, 2 months after the announcement, DOE extended the schedule for opening WIPP by 5 months—to June 1998—and reduced the scope of initially planned disposal operations. Although that schedule remains in effect, numerous unresolved issues, both within and beyond DOE's control, could affect when DOE can eventually begin disposing of wastes in the facility. For example, it is unclear whether DOE's schedule allows EPA sufficient time to review DOE's procedures and decide if DOE has complied with EPA's regulatory requirements for disposing of transuranic wastes in a repository.

Background

Transuranic wastes have been accumulating at DOE's nuclear defense facilities since the 1940s. Most transuranic wastes are either buried in shallow pits or stored above ground. After 1970, DOE and its predecessor agencies began packaging transuranic wastes in containers that could be stored for 20 years or more, pending their permanent disposal.

[2]Economic impact assistance payments are moneys that DOE is authorized to pay New Mexico, beginning with the fiscal year in which the transport of transuranic waste to WIPP is initiated, to help offset any financial burdens due to the operation of this first-of-a-kind research facility.

In December 1979, the Congress authorized DOE to build and operate WIPP expressly to demonstrate the safe disposal of radioactive wastes resulting from U.S. defense activities and programs.[3] WIPP is located about 26 miles east of Carlsbad, New Mexico, and lies in a salt formation about 2,150 feet below the surface. Construction of the primary WIPP facilities, including surface facilities for handling waste, shafts from the surface to the repository area, and one of eight planned disposal areas, was completed in 1988.

The 1992 WIPP Land Withdrawal Act (P.L. 102-579) required that before WIPP can become a permanent waste repository, the Administrator of EPA must certify that WIPP complies with EPA's disposal regulations for radioactive wastes. These standards set limits on releases of radioactive materials into the environment and on annual doses of radiation to people for 10,000 years after disposal. In addition, DOE must meet the disposal requirements for hazardous wastes defined under the Resource Conservation and Recovery Act of 1976, as amended (RCRA). RCRA's requirements apply to these wastes because well over 50 percent of DOE's inventory of transuranic wastes is also believed to contain hazardous waste components.

DOE plans to demonstrate regulatory compliance at WIPP through "performance assessment," an analytical method for predicting the behavior of WIPP for thousands of years and for estimating releases of radiation and hazardous chemicals to the general environment. The performance assessment method will use mathematical models developed and validated by information that DOE and its contractors—in particular, Sandia National Laboratories and Westinghouse Electric Corporation—are collecting through research and experimental programs. Part of DOE's overall research effort included plans to study, by means of tests in WIPP, the behavior of transuranic wastes to help determine WIPP's suitability for the permanent disposal of waste.

As of August 25, 1994, DOE had spent about $1.5 billion on construction, research, and other activities at WIPP, or about $1.8 billion in constant 1994 dollars. Annual funding for WIPP has averaged $190.4 million over the last 2 fiscal years. This amount included about $11 million per year for organizations that provide ongoing technical reviews of WIPP or are affected by WIPP's activities, such as New Mexico's Environmental Evaluation Group, the National Academy of Sciences' WIPP Committee, the

[3]Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (P.L. 96-164).

Western Governors Association, and various Indian tribes. Funds for activities devoted to planned underground testing in fiscal year 1993—the final year in which DOE supported underground waste tests—represented about 20 percent of the total WIPP funds to be spent that year.

Decision to Change Test Strategy Was Considered to Be Sound

Many scientists, experts, regulators, and other interested groups found DOE's decision to replace underground waste tests with laboratory tests to be sound. While many of these officials initially supported the concept of testing transuranic wastes in WIPP, DOE experienced numerous technical and operational problems with its planned tests. Although DOE several times redefined and scaled back its plans for testing wastes in WIPP, regulators, scientists, and others became increasingly concerned about (1) the usefulness of the data that the tests would produce, (2) DOE's limited success in resolving technical and operational concerns associated with the tests, and (3) DOE's large, continuing investment in money and time spent on the tests at the expense of other research in WIPP. DOE's shift in policy to laboratory tests was welcomed by many scientists, regulatory bodies, and other interest groups. Their general belief was that DOE's revised strategy was scientifically viable and appeared to be a promising avenue by which DOE could make an informed judgment on regulatory compliance at WIPP.

Despite Revisions to Underground Testing, Scientists' Concerns Persisted

Although initial acceptance existed for the concept of tests in WIPP, concerns by scientists and experts outside WIPP continued to mount over technical and operational issues despite DOE's numerous revisions to the test plans. As DOE's test program evolved, DOE changed the stated purpose of its proposed underground tests with transuranic wastes as well as the quantities of wastes needed to support the tests. Early in the program, DOE had emphasized the need to store as many as 125,000 55-gallon drums of wastes in WIPP. According to DOE, this large quantity was necessary to demonstrate safe and efficient waste-handling techniques and, to a lesser degree, to conduct tests to help determine WIPP's suitability as a waste repository.

But following the discovery that brine (water saturated with salt) was seeping into WIPP from the repository's walls, scientists outside WIPP raised concerns about WIPP's suitability for the permanent disposal of waste. The concerns centered on whether the interaction of the brine and the wastes would form gases that could drive contaminated wastes out of the repository and into the environment. Given the serious nature of the

concerns, groups such as the National Academy of Sciences' WIPP Panel (the predecessor of the WIPP Committee) urged DOE to study this issue more fully before storing large quantities of wastes in WIPP.

DOE responded, in April 1990, with a more modest test plan focused on collecting primary gas generation data from two types of underground tests. First, DOE would measure gases from wastes put in specially instrumented metal test containers, called bins. Second, DOE would measure gases from drums of wastes stored in smaller-scaled disposal rooms, or alcoves, in WIPP.

However, DOE again faced technical and operational difficulties. DOE could not develop and test an effective method for sealing the alcoves and ensuring accurate gas measurements. Also, DOE's planned test for studying the behavior of waste in certain bins injected with brine could not be performed without the risk of accidentally contaminating the repository. Furthermore, safety and operational concerns were expressed by key scientific and oversight review groups, such as the National Academy of Science's WIPP Panel and a blue ribbon panel established by former Secretary of Energy James D. Watkins, who initially had agreed that DOE should conduct the tests. Therefore, by early 1993, DOE had again changed the emphasis of its underground tests for assessing WIPP's performance. The emphasis was changed from obtaining primary data to obtaining supporting data that would confirm other information collected from laboratory tests.

DOE Abandoned Underground Testing

After subsequent critical reviews from EPA, DOE's own review team, the Academy's WIPP Panel, and others, DOE ultimately changed its test strategy to eliminate underground testing with wastes and replaced it with laboratory tests. For example, EPA identified problems with the plans for testing wastes underground that DOE had submitted to EPA for review and approval. Under the 1992 Land Withdrawal Act, such underground tests had to provide data "directly relevant" to a certification of compliance with EPA's radiation standards or to compliance with RCRA. Following DOE's submission of its plans to EPA in March 1993, EPA reported that the test plans were incomplete because they lacked technical details on certain design plans and tests. A key unresolved issue was whether the data that DOE would collect from its underground tests would be directly relevant to determining compliance with EPA's standards.

In April 1993, at the request of DOE management, the WIPP program initiated the Contingency Test Task Force to review potential alternatives to the underground testing approach. In mid-1993, while still pursuing its plans for testing wastes underground, DOE management also called for a comprehensive, independent review of the testing approach. The review team, consisting of a DOE team leader, DOE contractor staff, and private consultants not involved with the WIPP test program found significant technical shortcomings with the waste tests. It also found no regulatory, operational, or scientific imperative for the tests to be conducted underground. The team anticipated that laboratory tests would be an effective substitute and therefore recommended that DOE abandon the underground tests.

During September 1993, DOE weighed improving the underground waste tests against eliminating them altogether. Faced with considerable criticism of the underground testing strategy, including the results of its own independent review, DOE announced in October 1993 that it would eliminate these underground tests in favor of additional laboratory tests using real and simulated transuranic wastes. In the long run, DOE said, the new approach would be cheaper and faster to implement and would address criticisms made by the National Academy of Sciences, other reviewers, and stakeholders about the underground waste tests. DOE's decision was consistent with positions we had expressed in earlier testimony and reports. (See app. V for a list of GAO products on this topic.)

External Parties Supported DOE's Decision

Scientific, technical, and regulatory experts as well as state and local community groups agreed with DOE's decision to eliminate the underground tests. For example, EPA supported DOE's decision, stating that performing laboratory tests was a more effective and efficient means for DOE to reach a final decision on WIPP's suitability as a repository. Similarly, the National Academy of Sciences' WIPP Committee stated that the new DOE strategy was a significant step in the right direction and appeared to address concerns that the former WIPP Panel had raised in a 1992 report. In that report, the Panel noted that DOE had not convincingly justified its proposed tests and that DOE's concentration on these tests diverted time and resources away from other critical research. Finally, New Mexico's Environmental Evaluation Group reiterated its long-standing position that many of DOE's proposed underground waste tests could have been done in the laboratory, which would have allowed earlier collection of gas generation data. (App. I further discusses the evolution of DOE's plans for testing wastes underground and various perspectives on the changes.)

DOE's Projected Savings Are Not Justified

DOE has not justified most of the $139 million in savings that it attributed to its decision to abandon the underground tests in favor of laboratory-based tests. The largest component of the estimated savings ($88 million) related to the deferral of certain payments to New Mexico that are to begin with the first shipment of transuranic wastes to WIPP for testing or disposal. Deferring these payments, as DOE claimed, would reduce previously planned expenditures by $88 million by the beginning of 1998; however, the payments would still be made in future years. Therefore, the real savings are limited to the difference in the present value of the payments that would be made under the old and the new plans for completing waste tests in WIPP and for beginning to dispose of waste at the facility. Moreover, the support that DOE provided us with for the remaining elements of its projected savings was often incomplete, inconsistent, or altogether lacking.

Furthermore, documentation from DOE strongly indicated that budget constraints would probably preclude DOE from requesting $66 million in additional funds that it considered essential for improving the underground tests. Thus, deciding not to pursue the improved underground test program did not "save" $66 million because DOE did not expect that it would have included these additional funds in future budget requests. Finally, DOE may incur up to $10.6 million in additional costs, such as increased funding commitments to the local Carlsbad community, that related to DOE's decision to abandon the waste tests.

DOE Estimated $139 Million in Total Savings

DOE's projection of cost savings was based on a comparison of two options. Under option 1, the anticipated annual operating budgets for WIPP would be increased to make improvements to the plans for testing wastes underground. Under option 2—laboratory testing—the anticipated budgets would be reduced by replacing the underground tests with a program of enhanced laboratory tests and other related activities. In calculating the estimated costs of the two options, DOE began with its anticipated budgets for fiscal years 1994 through 2000. These budgets included, among other things, the costs to support ongoing and planned activities related to DOE's proposed underground tests at WIPP. For this 7-year period, DOE's total anticipated budget was over $1.5 billion. For option 1, DOE added to the budgets the additional costs it believed were necessary to improve the underground tests. For option 2, DOE added to the budgets the additional costs associated with the new test strategy and subtracted the costs it believed it would avoid under the option. Table 1 shows DOE's calculation of the $139 million in costs savings by choosing option 2 over option 1.

Table 1: DOE's October 1993 Comparison of Estimated Costs for Option 1 and Option 2 Test Programs

Dollars in millions

Cost element	Cost
Option 1	
Total anticipated WIPP budget, fiscal years 1994-2000	$1,538
Additional cost of modifications for underground waste testing	66
Total	**$1,604**
Option 2	
Total anticipated WIPP budget, fiscal years 1994-2000	$1,538
Additions to budget	
Enhanced laboratory tests	18
Accelerated compliance	9
New work scope	21
Staff retraining	3
Disposal phase readiness	8
Subtotal	**$59**
Deletions from budget	
Radioactive wastes operations and support activities related to the underground waste tests	(44)
New Mexico impact assistance	(88)
Total	**$1,465**
Savings, option 2 over option 1	**$139**

Source: Briefing paper on alternative costs by DOE's Office of Environmental Management, Sept. 26, 1993.

As shown in table 1, the largest item in DOE's cost savings projection was its deletion from the anticipated budget for WIPP of $88 million in impact assistance payments to New Mexico. The WIPP Land Withdrawal Act authorized the Secretary of Energy to pay New Mexico $20 million a year for 15 years, beginning with the fiscal year in which the transport of radioactive wastes to WIPP is initiated.[4] Prior to the act's passage, DOE had made commitments to New Mexico under which DOE intended to annually request from the Congress the authority and funding to make continual impact assistance payments to the state. Under option 1, DOE would have made impact assistance payments to New Mexico beginning in fiscal year

[4]The act also authorized annual adjustments for inflation after the first fiscal year, which DOE took into account when calculating the total amount of impact assistance deferred. Hence, the amount that DOE subtracted is more than $80 million for the 4-year period from 1994 through 1997.

1994, when WIPP was scheduled to receive wastes for underground tests. Under option 2, the payments would not begin until fiscal year 1998, when DOE expected to begin receiving transuranic wastes for permanent disposal in WIPP.

The remainder of DOE's estimated savings ($51 million) was based on costs avoided by eliminating improvements to the underground tests ($66 million) and related operations and support costs ($44 million), which were offset by the new scope of work for the laboratory-based tests ($59 million).

Projected Savings Are Not Justified

DOE's projected cost savings are not justified for two reasons. First, when DOE estimated that its new testing approach would result in deferring $88 million in impact assistance payments, it claimed that amount as the savings created over the course of the revised test program, which is projected to end in 1997. These payments, however, would be made later. Therefore, we believe that a more appropriate method of estimating the savings resulting from deferring the impact assistance payments is to limit the estimated amount to savings that the government would receive if DOE made these payments later than it otherwise would have. A widely accepted method of estimating this gain is to compare the present values of each stream of payments. Accordingly, we estimate that the 1994 present value of the savings resulting from deferring impact assistance payments is between $27 million and $32 million.[5] Although the payments would begin 4 years later as a result of DOE's decision to change its test program, a total of 15 annual payments would still be made to New Mexico because DOE anticipates that disposal operations in WIPP will last about 25 years.

Second, DOE's documentation supporting the remaining items in its projected cost savings (1) often did not match the figures that DOE had used in its analysis, (2) was incomplete or absent, or (3) was based on the professional judgment of DOE personnel. For example, there were inconsistencies in DOE's support for the $21 million cost of the new scope of work supporting the enhanced laboratory program under option 2. Likewise, DOE produced several documents that supported the cost of

[5]In calculating the present values of future streams of payments, we discounted the future impact assistance payments to their 1994 present values by applying a "real" discount rate to the anticipated payments before they were adjusted for inflation. Because the payments were not adjusted for inflation, a real discount rate, which adjusts only for the time value of money and not for inflation, is appropriate. We estimated the real discount rate by subtracting the rate of expected inflation from the prevailing interest rate for federal borrowing, a method which yielded a range of 3 to 4 percent.

option 1. These costs, however, varied widely from the $66 million cost that DOE claimed was necessary to improve testing under option 1. (App. II discusses DOE's limited support for these and other cost items.)

Other Factors Affect DOE's Claimed Savings

Two other factors also raise questions about the savings that DOE projected from its decision to substitute laboratory-based tests for underground tests. First, DOE had not included in its anticipated budgets the $66 million that it had estimated was needed to improve the planned underground tests under option 1. In fact, DOE's documentation strongly suggested that budget constraints would probably preclude DOE from requesting these additional funds. According to a May 1993 memorandum from the director of the WIPP Project Integration Office, a careful analysis of WIPP's budget showed that DOE had obtained its peak funding for the WIPP program and that future budgets would continue at a level reflecting increases for inflation only. Thus, it is questionable whether DOE could "save" funds that it did not expect to request and receive.

DOE's Director of the WIPP Program disagreed with this position. The director stated that if DOE had selected option 1, its senior management would have sought the additional budget requirements. However, other documents we obtained during our review tend to confirm our analysis that it was unlikely that future budgets for WIPP would have been increased to meet the funding requirements for option 1.

Second, DOE may incur more than $10 million in other costs related to WIPP that are not directly associated with DOE's old or new test strategy but would nevertheless result, at least in part, from the change in strategy. Since the change, for example, DOE has committed over $9 million to enhance economic development in the Carlsbad area because of citizens' concerns about the economic impact of discontinuing the underground testing. (App. II discusses these costs in more detail.)

DOE Will Not Meet Its October 1993 Projected Schedule

Although DOE claimed in October 1993 that its change in test strategy could accelerate, by 2 years, its proposed schedule for opening WIPP, the prediction proved to be unrealistic and faces numerous uncertainties. The analysis supporting DOE's decision to change the test strategy stated that DOE could begin disposal operations at WIPP in January 1998 rather than January 2000.[6] DOE believed that it could accelerate the schedule for two

[6]We did not evaluate the reasonableness of DOE's estimate that it would be able to begin waste storage operations at WIPP in January 2000, had it continued to pursue its former strategy of performing underground tests in WIPP.

reasons. First, DOE believed it would be able to collect supporting experimental data faster under the revised testing program. And second, DOE believed that it would no longer have to obtain EPA's advance approval of plans for the underground testing and retrieval of transuranic wastes in WIPP. DOE had estimated that EPA's review and approval of these plans would take about 10 months.

DOE's accelerated schedule, however, was very optimistic. Prior to announcing the accelerated schedule, for example, DOE's Assistant Secretary for Environmental Management stated, in a memorandum to the Secretary of Energy, that it was "possible" to open WIPP 2 years earlier under the new test strategy. However, the Assistant Secretary also predicted that waste operations would "likely" begin in 2000, assuming that no lawsuits would further delay the repository's opening. Also, according to the former Planning and Administrative Branch Chief of the WIPP Project Integration Office, the 1998 date assumed the best possible circumstances leading to a disposal decision and assumed that DOE would not encounter any bottlenecks in dealing with regulators or other participating organizations. He said that DOE would have to be extremely fortunate to arrive at a decision by 1998.

Shortly after developing the schedule, DOE quickly realized that the schedule was very optimistic. In December 1993, DOE added 5 months to the accelerated schedule and cut back the proposed scope of the initial disposal operations. Since that time, DOE has been reassessing its plans for WIPP.

Finally, unresolved issues could affect DOE's accelerated schedule. For example, DOE may have underestimated the time necessary for EPA to review and approve DOE's application for compliance with EPA's regulatory requirements. DOE projected that EPA's review and approval of the final application would take 12 months. An EPA official told us, however, that approval could take up to 16 months because of EPA's desire to obtain public comments on such proceedings, which is often a lengthy process.

Another important unresolved issue is DOE's ability to identify the important physical and chemical properties of the types of transuranic and hazardous wastes it intends to dispose of in WIPP. The identification of these properties is critical in order for DOE to document compliance with EPA's regulations and for EPA to decide whether it will certify DOE's compliance decision. Still another unresolved issue is the adequacy of program resources, both funding and staffing, to accomplish the steps

necessary to support the accelerated schedule. (App. III discusses DOE's schedule-related uncertainties in greater detail.)

Agency Comments and Our Evaluation

We provided a draft fact sheet reflecting the contents of this report to DOE and then met with the Department's Director of the WIPP program and other officials in the program to obtain their comments. We also provided a draft fact sheet to EPA and met with the agency's Director, Criteria and Standards Division, Office of Indoor Air and Radiation, and other agency officials to obtain their comments. The EPA officials agreed with the facts contained in our draft fact sheet. As requested, we did not obtain written agency comments on the report.

The DOE officials agreed that many components of DOE's estimated cost savings were preliminary but added that these estimates were based on the best information available at the time they were made. They disagreed with our analysis of the savings resulting from deferring payments of impact assistance to New Mexico. They pointed out that DOE had claimed savings only for the period from 1994 through 2000 and that the $88 million in deferred payments represents budgetary savings for that period. In our opinion, a meaningful measure of the true effects of deferring the assistance payments—rather than avoiding them entirely—can be determined only by looking at the impacts throughout the entire affected period, as we have done.

The DOE officials also stated that if cost savings are to be estimated over a time period that includes the operation of WIPP, then other long-term savings should also be included in the analysis. For example, by opening WIPP 2 years earlier than planned, DOE might save on the order of $200 million in operating costs over the life of the facility. The scope of our review, however, was limited to evaluating the estimated savings that DOE had announced, and DOE's savings did not include potential reductions in operating costs.

In addition, the DOE officials stated that there was no direct cause and effect relationship between DOE's decisions to cancel the planned underground waste tests and to increase economic assistance to the Carlsbad area. We added additional information to the report to show that there indeed was such a relationship.

Although the DOE officials acknowledged uncertainty about achieving DOE's accelerated schedule for WIPP, they also stated that had DOE decided to

continue the former testing approach, any slippage in the schedule would also have affected the former schedule. Therefore, they said that the 2-year advantage provided by the new program would be a constant. As stated earlier, we did not review the reasonableness of the former schedule.

On the basis of the comments discussed above and other comments made by DOE officials of the WIPP program, we made appropriate changes to clarify and update our report.

We conducted our review from February through December 1994 in accordance with generally accepted government auditing standards. Appendix IV provides more information on our scope and methodology.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to appropriate congressional committees; federal agencies; the Director, Office of Management and Budget; and other interested parties. We will also make copies available to others on request.

Please contact me at (202) 512-3841 if you or your staff have any questions. Major contributors to this report are listed in appendix VI.

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Director, Energy and
Science Issues

List of Requesters

The Honorable Floyd D. Spence
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Committee on Armed Services
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The Honorable Don Young
Ranking Minority Member
Committee on Natural Resources
House of Representatives

The Honorable Carlos J. Moorhead
Ranking Minority Member
Committee on Energy and Commerce
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The Honorable Michael Bilirakis
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The Honorable Dan Schaefer
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Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

The Honorable J. Dennis Hastert
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Environment, Energy, and Natural Resources Subcommittee
Committee on Government Operations
House of Representatives

The Honorable Jon Kyl
Ranking Minority Member
Panel on Military Applications
of Nuclear Energy
Committee on Armed Services
House of Representatives

The Honorable Michael D. Crapo
House of Representatives

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Abbreviations

DOE	Department of Energy
EPA	Environmental Protection Agency
GAO	General Accounting Office
RCRA	Resource Conservation and Recovery Act
WIPP	Waste Isolation Pilot Plant

Evolution of DOE's Decision to Abandon Underground Testing

Many scientists, regulators, and others interested in the Waste Isolation Pilot Plant (WIPP) initially agreed with the concept of testing transuranic wastes underground in the facility and did not oppose the Department of Energy's (DOE) efforts to conduct such tests.[1] In trying to implement these tests, however, DOE discovered that it could not establish that the tests were essential to demonstrating compliance with the Environmental Protection Agency's (EPA) disposal regulations for radioactive and hazardous wastes. Furthermore, because of mounting technical concerns about the tests, DOE continued to change its plans for testing waste underground in WIPP. In the end, however, DOE had not satisfied EPA's and others' lingering questions about the need for underground tests with transuranic wastes.

DOE's October 1993 decision to direct the test program away from underground tests with transuranic wastes to laboratory-based tests was endorsed by many members of the scientific community, regulators, and other organizations.

DOE's Rationale for Proposed Underground Testing Changed Over Time

As the WIPP program evolved, the stated purpose of the underground tests with wastes changed as did the quantities of wastes that DOE said would be needed to support them. In the early years of the program (1983 through 1988), DOE's plans centered on storing 125,000 55-gallon drums of transuranic wastes in WIPP to conduct a large-scale "operations demonstration" of efficient and safe waste-handling techniques and, to a lesser degree, to evaluate the proposed repository's suitability for the permanent disposal of waste.[2] However, scientists and experts—such as the National Academy of Sciences' WIPP Panel and New Mexico's Environmental Evaluation Group—thought that DOE had placed too much emphasis on storing large quantities of waste underground before demonstrating that WIPP could meet EPA's disposal standards.[3] Furthermore, these scientists noted that DOE had not clearly defined how the underground tests with wastes would demonstrate compliance with EPA's standards.

[1]Transuranic wastes are certain nuclear wastes from the nation's defense program such as tools, paper, and rags that are contaminated with long-lived, radioactive elements having atomic numbers higher than uranium.

[2]Of the 125,000 drums, DOE was to use 100,000 drums to support an operations demonstration and 25,000 drums for experiments related to WIPP's compliance with regulations.

[3]EPA originally developed pertinent radiation standards in 1985 and amended them in 1993.

In 1986 and 1987, scientists' discovery that brine (water saturated with salt) was seeping onto the walls of WIPP's underground area—when the facility was expected to be dry—raised questions about the facility's suitability for the disposal of transuranic wastes. A panel of New Mexico scientists advanced the theory that EPA's disposal standards might be violated at WIPP because (1) the repository would become saturated with brine soon after closure, (2) the interaction of the waste and the brine would stimulate the production of gases within the disposal rooms, (3) the combination of gas build-up and salt "creep" (i.e., the inward movement of the surrounding rock to fill in open spaces) would eventually pressurize the gases in the repository, and (4) the pressurized gases would drive contaminated wastes out of the repository and into the general environment. Possible ways that such wastes could escape were through fracturing in the salt and adjacent rock formations or through inadvertent human intrusion, such as oil exploration sometime in the future.

WIPP advisory groups such as the National Academy of Sciences' WIPP Panel urged DOE to study the brine inflow and the possibility of gas generation at WIPP and, in the interim, to limit the quantity of wastes stored at WIPP to the minimum necessary to demonstrate compliance with EPA's disposal standards. Also, we along with others, recommended in 1989 that DOE provide the Congress with the technical justification for storing wastes in WIPP, including the justification for the quantities of such wastes to be used for tests, DOE's plans for the retrieval of such waste, and the identification of alternative storage sites if retrieval becomes necessary.[4]

As suggested by several parties, DOE reduced the scope of planned underground tests with wastes in 1989 and 1990 and significantly reduced the quantities of waste that would be used for these tests. Also, DOE developed more detailed underground test and waste retrieval plans and indefinitely postponed a large-scale operations demonstration. In April 1990, DOE published a test plan describing two types of underground waste tests to study gas generation for the radioactive components of transuranic wastes and the hazardous waste components regulated under the Resource Conservation and Recovery Act (RCRA). DOE maintained that it was necessary to perform the following tests over a 5-year test phase:

- Bin tests—tests to be done in specially instrumented and sealed metal containers (bins), each holding about six 55-gallon drums of

[4]Nuclear Waste: Storage Issues at DOE's Waste Isolation Pilot Plant in New Mexico (GAO/RCED-90-1, Dec. 8, 1989).

contact-handled transuranic wastes.[5] DOE planned to use 124 bins of waste (the equivalent of about 600 drums) to answer questions about the types and quantities of gases such as hydrogen that would be generated from transuranic wastes as they degrade in a repository environment characterized by brine. DOE planned to introduce different materials into the bins that would potentially generate gas into combinations of possible environments expected at WIPP (dry, wet, with or without oxygen, and with or without added materials thought to inhibit gas production). Among other things, DOE maintained that the tests were necessary to more accurately predict synergistic effects of different gas production mechanisms.

- Alcove tests—tests to be done on a larger scale, that is, in rooms one-third the size of a normal disposal room in WIPP. Six alcoves were to be filled with about 3,900 drums of contact-handled transuranic wastes and the entrances of the rooms were to be sealed.[6] DOE said that the tests were necessary to approximate the impacts of the actual repository environment on the wastes as they degrade over time.

Both the bin and alcove tests would also provide information to verify DOE's demonstration that hazardous materials would not migrate from the repository over the short- and long-term and to test potential waste treatment solutions, should they be required to bring WIPP into compliance with EPA's regulations.

Operational and Technical Difficulties Impeded DOE's Implementation of Underground Waste Tests

The Secretary of Energy determined in June 1990 that WIPP was the most suitable place to perform the bin tests and recommended that DOE begin the tests with waste in the facility. Early in the program, however, DOE encountered numerous operational and technical problems associated with these tests, such as the following:

- Planned tests involving injection of brine into the bins could not be safely performed underground because of the risk of accidentally contaminating the repository.
- The metal bins were not designed to accommodate high gas pressure. Also, to meet EPA's RCRA requirements, DOE had to limit the concentration of explosive gases (such as hydrogen) that would build up in the bins. To

[5]There are two types of transuranic wastes in DOE's inventory—contact-handled wastes, which are generally stored in 55-gallon metal drums and can be moved by workers without additional protection, and remote-handled wastes, which require special shielding to protect workers and the public from hazardous exposure.

[6]One of the alcoves was to remain empty to provide "baseline" (reference) data on the conditions of the disposal rooms.

accomplish this, the bins would require the frequent purging of gases. However, scientists maintained that purging would introduce sampling errors into the gas generation data that DOE would collect from the bins.

- Because DOE did not plan to test the bins at high gas pressure, some scientists did not expect these tests to provide DOE with useful data on anticipated, long-term conditions in the repository.
- EPA and oversight groups wanted the waste contents of the bins to statistically represent DOE's transuranic waste inventory and to present acceptable handling and storage risks. For these reasons, identifying the important chemical and physical properties of the waste (i.e., characterizing) and loading the bins took much longer than DOE had anticipated. From 1991 through 1994, according to DOE officials, DOE characterized only seven bins at a cost of about $1 million per bin.
- The movement of salt rock surrounding the waste disposal rooms at rates three times faster than DOE originally predicted (salt creep) led to several large rock falls in the facility. Scientists and the state of New Mexico were concerned that the instability of rooms in the facility might pose a threat to workers and to the retrievability of the waste. To address these concerns, DOE spent over $1 million in installing a roof support system in one of the disposal rooms to be used for the bin tests.

The planned alcove tests also experienced technical setbacks. In particular, DOE had not demonstrated an effective method of sealing the room entrances to ensure the accurate identification and measurements of the gases that would form in the rooms. DOE spent several years and over $2 million in trying to develop an effective alcove-sealing and gas-sampling system, but it was still unclear whether DOE's proposed seal design would have withstood rock fracturing at WIPP. And even if effective seals could be designed, experts raised questions about whether the planned duration of the tests would allow enough time for sufficient quantities of gases to form to provide meaningful measurements.

Key WIPP scientific and oversight review groups were disappointed with DOE's slow progress in conducting the proposed underground waste tests and still had concerns about the operational and technical aspects of the tests. In April 1991, for example, the National Academy of Sciences' WIPP Panel said the planned bin tests were consuming far more resources than anticipated, but were not proceeding at a rate fast enough to yield meaningful information within the schedule. Such delays, the Panel's Chairman stated, may further shorten the time available for measuring gas generation within the repository and thus increase the uncertainty associated with the data that would be collected.

Members of a blue ribbon panel, commissioned by the Secretary of Energy from 1989 through 1991 to review DOE's test program, also expressed concerns. Although the panel initially endorsed the underground tests with wastes and believed that WIPP was the best available place to do them, two panel members acknowledged, as their study progressed, that DOE had to resolve many operational and safety issues associated with the tests. For example, DOE had not developed a procedure for safely sampling the waste/brine contents in the bins. Also, in August 1991, three of the five panel members reported to DOE that because the sealing problems had seriously set back the alcove tests, DOE might have to do those tests elsewhere. Furthermore, they did not expect the alcove tests to provide much new information on the long-term safety of WIPP.

In June 1992, the Academy's WIPP Panel commented that the bin tests, as DOE had designed them, had no discernable scientific basis and probably would not yield meaningful information for assessing the facility's performance as a repository. Finally, the Academy's Panel noted that DOE was not giving other critical research areas timely or adequate attention. That same year, New Mexico's Environmental Evaluation Group commented that DOE's continued preoccupation with implementing its bin and alcove test plans had diverted attention from the data collection and analysis that DOE needed to reach a decision on WIPP's suitability as a permanent repository.

By the end of 1992, DOE had scaled back the bin test program so that 19 bins (about 95 drums) of transuranic wastes would be tested, with the possibility that another 25 bins could be tested. Earlier that year, DOE's own scientific advisor for WIPP—Sandia National Laboratories—stated that the alcove tests were no longer essential for demonstrating WIPP's compliance with EPA's radiation disposal standards. However, DOE and Sandia continued to support transuranic waste tests in at least one alcove primarily to measure gases related to compliance with RCRA. In March 1993, at the suggestion of the Academy, DOE took its bin tests off the "critical path" of its schedule for opening WIPP. In a revised test plan issued that same month, DOE stated that the focus of these tests had changed from providing a "primary," or direct, source of data for the performance assessment to a "secondary" source of data for confirming gas generation data collected from ongoing laboratory tests. Data from the laboratory tests would be used as the primary data in the performance assessment.

In the revised plan, DOE distinguished between two types of bins that it would use for tests: a "type 1," or low-pressure, bin designed to replicate

anticipated conditions for the period immediately after the facility is closed and a "type 2," or higher-pressure, bin intended to simulate anticipated conditions in the repository over longer periods of time. DOE said that it would need 19 to 44 bins of varying types of contact-handled transuranic wastes for "specifically planned tests" and in the event that additional tests were required. DOE also noted that one alcove filled with about 1,000 drums of unmodified transuranic wastes would be tested, and that possibly one other alcove would be targeted for additional tests.

EPA Found DOE's Underground Test Plan Incomplete

About the same time that DOE was refining its test plan, the Land Withdrawal Act of 1992 was enacted, mandating that EPA must approve DOE's (1) plans for performing tests with waste in WIPP and (2) DOE's plans for retrieving such waste before the Department could begin underground tests with transuranic wastes. In March 1993, DOE submitted revised test and retrieval plans to EPA for its review.

In May 1993, after a preliminary review of DOE's submittal, EPA informed DOE that its test plan was incomplete. Among other things, EPA noted a lack of technical detail in the plans for underground tests. For example, DOE had not submitted design plans to EPA for the type 2 bins nor had it completed many of the details of the alcove tests, such as a specific test plan, the fabrication of an alcove entrance seal, and gas management/sampling systems. Also, EPA observed that DOE's justification for the bin and alcove tests was not linked to EPA's radiation standards, which raised a question of whether the tests would yield information "directly relevant" to compliance with EPA's radiation standards.[7]

In attempting to address EPA's concerns, DOE submitted additional information to EPA in June 1993. However, DOE's internal correspondence in early August 1993 noted that EPA still had outstanding questions about the test plans, including clarification of the linkage of the tests to the WIPP performance assessment and the "directly relevant" issue.

DOE Reversed Testing Strategy

While DOE continued to pursue its underground test strategy, in July of 1993, it also reassessed the need for the underground transuranic waste tests and eventually reversed its position. In late July 1993, DOE held a program "summit" on WIPP, to give interested scientists, regulators, and other groups an opportunity to meet and discuss various test program

[7]According to an EPA official, EPA never formally defined what is meant by "directly relevant" in its radiation standards. This official stated that had DOE continued to pursue underground testing in WIPP, EPA would likely have had to clarify the term "directly relevant" through a future rulemaking.

issues. Participants raised many concerns paralleling those of EPA. For example, some participants said that at best, the bin and alcove tests were not designed to yield meaningful information for the performance assessment and, at worst, were unnecessary. Some participants also believed that the tests would take too much time, be expensive, or not yield results when needed.

In September 1993, a team comprising a DOE official, staff of DOE contractors, and private consultants not involved with the WIPP testing program completed a review of the need for, and the technical validity of, the bin and alcove tests. The review team concluded that there was no operational, regulatory, or scientific imperative that the bin and alcove tests with transuranic wastes be conducted in WIPP. The team also found that laboratory tests such as (1) larger-scale tests using off-the-shelf or custom-built equipment with simulated radioactive wastes and (2) smaller-scale tests using actual transuranic wastes would explain both the effects of individual gas-generation mechanisms and the synergistic effects of combining different waste materials. The team recommended that DOE drop the bin and alcove tests and initiate the laboratory-testing activities in their place.

In the same month, senior managers at DOE weighed whether to improve the underground tests or to abandon them.[8] For example, they considered increasing the bin design pressure through more costly modifications. In an October 7, 1993, memorandum, DOE's Assistant Secretary for Environmental Management informed the Secretary of Energy that EPA might not approve DOE's underground test plan ". . . because of its [the plan's] perceived failure to demonstrate a clear relationship between the proposed waste tests and regulatory requirements . . . and EPA may have a great deal of difficulty concluding the tests will in fact provide data that is 'directly relevant' to demonstrating compliance. . . ." The Assistant Secretary also stated that the alcove program had little chance of meeting the "directly relevant" standard and, therefore, had been removed from the current test plan.

On October 21, 1993, DOE announced the elimination of the underground tests and replaced them with additional laboratory tests using both simulated and real transuranic wastes.

[8]In April 1993, the WIPP project had set up a group—The Contingency Test Task Force—to identify potential alternatives to the underground waste tests at WIPP in case DOE decided not to go ahead with the waste tests in WIPP. This, along with the results of the independent technical review, was provided to DOE management for its consideration.

Outside Groups Supported Change in WIPP's Testing Strategy

Regulators, experts, and others interested in WIPP generally supported DOE's decision to abandon the underground tests with transuranic wastes. For example, in a press advisory dated October 22, 1993, EPA stated that performing laboratory tests in lieu of the underground waste tests is a more efficient and effective means for DOE to arrive at a final disposal decision on WIPP. The Director of EPA's Office of Radiation and Indoor Air told us that in October 1993, DOE's Assistant Secretary for Environmental Management met EPA's Deputy Administrator prior to the decision. According to the Director, EPA agreed to support, in principle, DOE's decision to abandon the underground tests because of the substantial incompleteness of DOE's plans for bin and alcove tests. Also, EPA believed that the waste tests could be controlled more carefully in a laboratory setting rather than in WIPP. The Director emphasized that the decision to abandon the tests was DOE's alone and that from EPA's viewpoint, there was no regulatory imperative that DOE emplace transuranic wastes in WIPP to demonstrate compliance with EPA's radiation standards.

EPA had previously supported the concept of underground testing in WIPP and, in fact, recommended in late 1989 that DOE fill two instrumented test rooms with waste in order to continually monitor compliance with EPA's radiation standards. However, the Director of the Criteria and Standards Division of EPA's Office of Radiation and Indoor Air said that following the passage of the Land Withdrawal Act, EPA's perspective changed. Consequently, EPA had to ensure that DOE fulfilled the statutory requirements of the act. Because DOE's underground test plans were so incomplete, the director said, EPA could not continue to review DOE's plans for underground tests and retrieval of waste unless DOE provided EPA with additional information on the tests.

Several technical review and oversight groups also supported DOE's decision to cancel the underground tests.

- The National Academy of Sciences' WIPP Committee (formerly the WIPP Panel), in an October 21, 1993, press release, stated that the new DOE strategy appeared to address many of the Academy's concerns about the old test program and was a "significant step in the right direction." Two members of the WIPP Committee told us that it was apparent that DOE would have had continued difficulties had it stayed on its course of pursuing its underground test plans and that the value of the underground tests with transuranic wastes as DOE had designed them had become highly questionable. They stated that the program's new test strategy appeared

promising, although they did not oppose the concept of underground testing.

- For several years, New Mexico's Environmental Evaluation Group had recommended that DOE start immediately collecting gas generation data through other means, such as collecting data at another DOE facility. The group's Deputy Director stated that if DOE had started such tests earlier, it might have already collected much of the data that it would need to support its gas generation models for the performance assessment.
- The Southwestern Research and Information Center—a nonprofit educational and scientific organization based in Albuquerque, New Mexico—had urged DOE to cancel the underground waste tests because they were expensive, unnecessary, and unscientific.
- The Natural Resources Defense Council—an environmental interest group—agreed with DOE's decision to abandon the underground tests and endorsed DOE's move to above-ground testing. In an October 1993 letter to DOE, an official with the Council noted that above-ground testing is the most cost-effective and expeditious way of demonstrating WIPP's compliance.

The Governor of New Mexico stopped short of endorsing DOE's new test strategy but noted that the state was open to considering the changes as long as they (1) did not adversely affect the health and safety of New Mexicans, (2) furthered the goals of promoting the environmental cleanup of DOE facilities in New Mexico, (3) led to a plan better suited to achieving or demonstrating compliance with applicable federal and state regulations, and (4) did not adversely affect economic assistance commitments that DOE had made to the state. Officials from the state's Environmental Division told us that DOE's abandonment of the underground tests with wastes and adoption of additional laboratory tests should not have any impact on whether DOE can or cannot demonstrate compliance with EPA's standards.

Cost Savings Could Not Be Verified, and Other Related Costs Were Omitted

In October 1993, DOE estimated that it would save $139 million over the 7-year period 1994 through 2000 by changing the test strategy for WIPP. DOE computed the savings by calculating the difference between the estimated expenditures under two options. Under the first option, the underground testing program would be continued with certain modifications to planned tests. Under the second option, the underground tests would be replaced with enhanced, above-ground laboratory tests intended to replicate expected underground conditions at WIPP.

In analyzing the costs of the two options, we were unable to verify most of DOE's individual cost estimates. Furthermore, we identified additional costs that DOE is likely to incur that are related to the change in test programs.

Most Costs Could Not Be Verified

The validity of many of the individual cost items that DOE presented in its analysis could not be verified. In some cases, supporting documents contained incomplete or conflicting information; in other cases, supporting documents were lacking altogether. DOE itself recognized the preliminary nature of its cost calculations; for example, it developed specific cost elements for option 2 without detailed supporting analyses.

We could not validate the cost of the scope of new work under DOE's option 2 because DOE's documentation was incomplete and conflicted with the numbers that DOE used in its cost estimate. DOE's estimate showed that $21 million would be needed for the scope of new work—$7 million per year for 3 years beginning in fiscal year 1994. However, the documentation that DOE provided—a contractor's proposal for nine new projects—equaled twice as much as the estimate that DOE used in its analysis and covered only a 1-year period. According to an official in DOE's Office of Environmental Management, the contractor's proposal overreached DOE headquarters' expectations. On the basis of his judgment, the official selected four new work projects from the contractor's proposal. However, the 1-year estimated cost of the four projects was $5.9 million rather than the $7 million that DOE used in its analysis.

Similarly, we could not validate DOE's cost estimate for the option 2 enhanced laboratory program. DOE's analysis showed that the enhanced laboratory program would cost $18 million; according to the DOE official mentioned above, this total was a rough estimate made by the contractor on short notice. After the change in the test strategy was announced, the contractor provided a written estimate that totaled $22.7 million, or 26

percent more than the $18 million total. This official said that the difference was due to the fact that the contractor did not consider the accelerated schedule. Another official, the former Planning and Administrative Branch Chief of WIPP's Project Integration Office, said that the $18 million total represented the laboratory activities that DOE considered to be absolutely essential. According to the Director, WIPP Program Office, the initial estimate did not take into account a 1998 start for disposal operations and was reduced by the former WIPP Project Integration Office. Furthermore, the Director said that because the enhanced laboratory program is now more mature, the current cost estimate has decreased to $10 million.

Furthermore, DOE could not provide us with documentation to support other related cost items in option 2. Specifically, DOE lacked supporting documentation for its cost estimate for retraining staff. According to DOE's analysis, the cost of reassigning and retraining WIPP staff of the Department's management and operating contractor (Westinghouse) totaled $3 million. This cost applied to those staff whose positions would be eliminated or reassigned when the planned underground tests were canceled. A DOE official said that he estimated the amount on the basis of his professional judgment. According to the Director, WIPP Program Office, the estimate was subsequently endorsed by Westinghouse staff and included in their transition plan for the new test strategy.

Finally, conflicting information from DOE's supporting documents also prevented us from verifying DOE's costs to modify and continue the bin experiments. Although DOE had spent considerable time in planning the underground bin tests, it had not decided on a final design for a key component of the tests—the type 2 (high-pressure) test bin. DOE and its contractors had developed several widely varying cost and requirements estimates around the same time that DOE prepared its cost analysis. One estimate—$143 million to construct 26 bins—included a "level of confidence" that the costs would range between $113 million and $173 million. A second estimate was $66 million for 15 bins. DOE used yet a third estimate of $66 million for 12 bins as the basis for its cost analysis. The former Planning and Administrative Branch Chief of WIPP's Project Integration Office told us that the differences between estimates were due to changing design specifications—such as the required internal pressure capabilities for the bins—as DOE modified its plans for the final requirements for the bins. This official said that, had DOE proceeded with the underground tests, the requirements and DOE's final costs would have probably changed once again.

Other Costs May Be Incurred Because of Changes in Test Strategy

Not only was DOE's projection of the $139 million in cost savings questionable, but DOE may incur up to $10.6 million in costs for local economic development and the formation of the DOE Area and National Transuranic Program Offices in Carlsbad, New Mexico. While DOE appeared to have made the decisions to incur these costs after its October 1993 analysis, these costs are relevant nevertheless and are attributable in part to the change in test strategy.

In response to the concerns that local citizens of Carlsbad had raised about the economic effects of discontinuing the underground test program, DOE increased its commitment to economic development in that community by more than $9 million. Specifically, in March 1994, DOE increased its funding commitment to the Carlsbad Environmental Monitoring and Research Center—an independent monitoring facility funded by DOE through the Waste Management Educational Research Consortium and administered by New Mexico State University. The increase was for $7 million over and above the $25.9 million that DOE had already committed to support the procurement of equipment and to support the center's operations. In addition, DOE extended the grant period from fiscal year 1997 to 2003, which will enable the center to acquire a building for its operations. DOE has also approved other proposals for economic development. These include $2 million to establish an Advanced Manufacturing and Innovation Training Center for southeast New Mexico that would facilitate the transfer of advanced manufacturing technologies to public and private concerns through business training and support. A February 24, 1994, DOE memorandum discussing these commitments specifically noted that DOE made the commitments "in part" because of the change in test strategy.

Furthermore, DOE decided to establish an Area and National Transuranic Program Office in Carlsbad to centralize WIPP's program management functions in that city. This decision could increase WIPP's costs by as much as $1.3 million. DOE officials did not attribute the decision to establish the new office to the change in DOE's test strategy and said that DOE had been considering making such organizational changes several months prior to its October decision. However, several events clearly suggest a link between this decision and local concerns about the economic effects of DOE's change in test strategy. These are (1) Carlsbad community leaders' continuing efforts to have DOE centralize the management of WIPP's functions in Carlsbad, (2) DOE officials' interest in maintaining local support for WIPP, (3) the fact that the formation of the Carlsbad offices reversed DOE's June 1993 decision to retain 14 of 24 WIPP management

positions in Albuquerque rather than centralize them in Carlsbad, and (4) DOE's decision, within 1 week after the change in test strategy, to consolidate WIPP's management at Carlsbad.

The increased costs of $1.3 million included staff relocation costs and other expenses that may be incurred because of the transition period. About $860,000 of these costs relate to DOE. The remaining costs of approximately $440,000 are related to the formation of the Area Office and National Transuranic Program Office that Sandia National Laboratories expects to incur.

Numerous Uncertainties Affect DOE's Claimed Schedule Savings

As previously discussed, DOE's predicted 2-year savings in the scheduled opening of WIPP due to its change in testing strategy proved to be unrealistic. Furthermore, we identified some uncertainties, both internal and external to WIPP, that also continue to raise questions about DOE's projected schedule. First, DOE's schedule lacked specifics such as intermediate milestones for meeting an accelerated date for the disposal of waste at WIPP. Second, when DOE added 5 months to the accelerated schedule in December 1993, it also cut back the scope of its proposed initial disposal operations. Third, DOE faces major uncertainties with the WIPP program that could significantly affect the Department's ability to meet the accelerated schedule. The uncertainties include DOE's efforts to identify and characterize the types of transuranic and hazardous wastes that it intends to dispose of at WIPP and the level of staffing and resources necessary to support the accelerated schedule.

DOE's Accelerated Schedule Lacked Essential Details

DOE's schedule accompanying its October 1993 decision lacked details on the specific steps necessary to support DOE's claim that the Department could accelerate WIPP's scheduled opening by 2 years. For example, the schedule included milestones for both beginning and ending the enhanced laboratory program—DOE's substitute program to collect gas generation data necessary to validate the performance assessment models. But when DOE had prepared the schedule, it had not yet determined the enhanced laboratory program's scope nor had it identified the participants in the program who would be doing the additional tests supporting this effort.

The schedule also lacked details on the timing of other key elements of the WIPP program, such as tests to describe the fraction of regulated radioactive and hazardous materials within WIPP that could be potentially mobilized and escape the repository because of naturally occurring events (e.g., flooding) or from inadvertent human intrusion (e.g., drilling for oil or natural gas). Such materials, referred to as the source term, potentially can be transported to the general environment through dissolution into groundwaters. DOE's planned source term tests may span several years, and it was unclear from the schedule whether their timing was such that results could be obtained to complement the enhanced laboratory program's results. According to DOE, data from both experimental programs will be important to feed into DOE's models for assessing the repository's long-term performance.

DOE Cut Back Scope of Accelerated Schedule

Two months after DOE's October 1993 decision, DOE changed the accelerated schedule. In December 1993, DOE released a working draft of its "disposal decision plan"—a more detailed schedule that showed various activities and milestones leading to WIPP's opening. In addition to adding 5 months to WIPP's projected opening date, the December schedule also reduced the proposed scope of WIPP's initial disposal operations. Prior to December 1993, DOE made no distinction in its accelerated schedule between DOE's readiness to receive contact-handled and remote-handled wastes when it began disposal operations.

DOE's December schedule, however, did not include a date for the initial receipt of remote-handled waste at WIPP. According to the schedule, the decision on receiving that waste would not occur until July 1999 or later. DOE's timing of emplacing remote-handled waste may have important implications for waste handling and management and workers' safety. The reason for this is that DOE's initial plans called for remote-handled waste to be placed into horizontal holes bored into the walls of WIPP's disposal rooms before the loading of contact-handled waste onto the floors of the rooms.

Uncertainties Could Affect Accelerated Schedule

Because DOE's schedule for achieving accelerated compliance was so optimistic, there may be little time built into the schedule to resolve critical issues that could affect the success of DOE's research program for WIPP. In meeting its accelerated schedule, DOE must address challenging issues, including some that are beyond its control. These include waste characterization, DOE's dependence on regulators' actions, and the availability of sufficient resources for the program.

Evolving Waste Characterization Activities Will Take Time

EPA and others are concerned that DOE needs to increase its understanding of the characteristics of waste that will be placed at WIPP. Such an understanding is necessary before DOE can submit a complete application to EPA requesting that EPA certify DOE's compliance with EPA's waste disposal standards pertaining to WIPP. The reason for this is that variances in the characteristics of waste could affect WIPP's ability to comply with EPA's regulatory requirements. When DOE announced its change in test strategy, its efforts to study the characteristics of the waste inventory across the DOE complex were substantially incomplete. Also at that time, DOE indicated that it would develop a new approach—the establishment of performance-based waste acceptance criteria—for determining current

and future waste streams bound for WIPP.[1] However, the acceptability of this approach was not discussed with EPA.

The uncertainty associated with waste characterization is illustrated by the fact that EPA, in a November 8, 1993, letter to DOE, raised significant concerns about the adequacy of DOE's efforts to study the comparative characteristics of remote-handled versus contact-handled wastes. Among other things, EPA stated that it was unclear how DOE planned to perform comprehensive comparative remote-handled and contact-handled waste characterization within the schedule provided when the contact-handled waste characterization program was "at its infancy."

Uncertainty Exists Over Funding and Staff Resources

Uncertainty also exists over whether DOE will have adequate resources to accomplish the accelerated schedule. As discussed earlier, DOE recognized the preliminary nature of the cost estimates for the enhanced laboratory program but neither identified the specific funding requirements nor the actual scope of work needed to support the new WIPP research activities. Thus, it was uncertain whether DOE would have sufficient funds available to meet the revised schedule at the time of the change in test strategy. Also, DOE had not considered how this funding would be phased into the program over time.

Furthermore, in October 1993, when DOE announced that it would transfer critical program management functions for WIPP from Albuquerque to Carlsbad, the efficiencies of this decision on the project were unclear. That is, DOE did not know which of the affected staff were willing to relocate to Carlsbad, and DOE did not consider the potential effects on the program's schedule if some or all of the affected staff chose not to relocate. For example, delays in the program could result from a need to fill key management vacancies and to retrain staff.

[1]The establishment of performance-based waste acceptance criteria is a concept for "screening" waste streams before they enter WIPP. DOE would use its performance assessment as a starting point to establish bounding conditions, or an "envelope," in which wastes stored in WIPP will fall. By comparing DOE's waste characterization database with the "envelope," DOE can demonstrate which existing and future wastes are expected to be acceptable for disposal at WIPP and which are not.

Scope and Methodology

We performed our work at DOE's headquarters in Washington, D.C.; at DOE's Albuquerque Operations Office and at Sandia National Laboratories in Albuquerque, New Mexico; at DOE's Carlsbad Area Office in Carlsbad, New Mexico, and at DOE's Waste Isolation Pilot Plant near Carlsbad; and at WIPP's support contractors' locations in Albuquerque and Carlsbad. We also performed our work at EPA's headquarters in Washington, D.C.

To evaluate the scientific soundness of DOE's October 1993 decision to replace underground tests with radioactive wastes with laboratory tests, we interviewed officials from DOE and its contractors. We obtained and reviewed DOE's and its contractors' correspondence, reports, test plans, and other pertinent documents, particularly covering the period from December 1992 through January 1994. We also reviewed the minutes of past EPA and DOE meetings regarding DOE's test and retrieval plans. In addition, we spoke with officials and obtained documentation from EPA's Office of Radiation and Indoor Air; the National Academy of Sciences' WIPP Committee; the state of New Mexico (including its Environmental Evaluation Group); members of DOE's former Blue Ribbon Panel on WIPP (commissioned from 1989 to 1991); and interested groups located in New Mexico.

Furthermore, we attended meetings held by the National Academy of Sciences in December 1993 and in April and June 1994 and meetings held by EPA in February and June 1994. To supplement the historical perspective on DOE's WIPP test program, we drew largely upon our previous testimonies and reports issued from 1988 through 1991. (See list of related reports and testimonies in app. V.)

To ascertain whether DOE's projected cost savings were reasonable, we reviewed and analyzed DOE's and its contractors' documents supporting DOE's comparison of the estimated costs of either continuing underground tests with radioactive wastes or replacing these tests with above-ground laboratory tests. We discussed the documentation with and obtained the views of officials at DOE's headquarters office, Albuquerque Operations Office, and Carlsbad Area Office and with DOE's contractors.

We also attempted to identify other costs related to the change in test strategy that DOE did not include in its analysis. To accomplish this, we reviewed and analyzed DOE's documents concerning DOE's budgeting process for WIPP for fiscal years 1993 and 1994 and the documents supporting DOE's October 1993 decision to abandon underground tests. In

addition, we discussed these cost items with officials of DOE and its contractors.

To determine the validity of DOE's claim that it would shorten its schedule for opening WIPP by changing its testing strategy, we reviewed, analyzed, and compared DOE's schedules before and after its October 1993 change in test strategy. In addition, we reviewed DOE and EPA documents related to DOE's schedule and discussed DOE's schedule with officials at DOE headquarters, Albuquerque Operations Office, and Carlsbad Area Office, and with officials of EPA and other interested groups.

We discussed the facts presented in this report with DOE headquarters officials and incorporated their comments where appropriate. However, as requested by representatives of the congressional requesters' offices, we did not obtain written agency comments on a draft of this report from DOE or other parties. We conducted our work from February through December 1994 in accordance with generally accepted government auditing standards.

Related Studies

GAO Products

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