

GAO

Briefing Report to Congressional Requesters

July 1987

OIL RESERVE

DOE's Management of the Strategic Petroleum Reserve



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Resources, Community, and
Economic Development Division

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July 17, 1987

The Honorable Jack Brooks
Chairman, Committee on
Government Operations
House of Representatives

The Honorable Mike Synar
Chairman, Subcommittee on Environment,
Energy and Natural Resources
Committee on Government Operations
House of Representatives

This briefing report responds to your December 3, 1986, request that we review several aspects of the Department of Energy's (DOE) management and policies regarding the Strategic Petroleum Reserve (SPR). You expressed particular interest in (1) DOE's response to a number of management and operations improvement recommendations made in an internal assessment made in 1983, (2) the seriousness of erosion and corrosion problems experienced in some SPR pipelines, (3) the possibility of damage to SPR oil from salt-tolerant bacterial contamination, (4) DOE's plans for decommissioning the Sulphur Mines, Louisiana, oil storage site, (5) DOE's plans for improving SPR oil distribution capability, (6) DOE's plans for filling the SPR, and (7) the comparability of SPR security with security systems used at nuclear facilities and the adequacy of the SPR security system.

A summary of our findings follows:

- Although DOE has characterized all 170 recommendations as "closed," we found that implementation of 6 recommendations (3 classified, 3 unclassified) has not been completed. DOE estimates that it will cost approximately \$21 million through fiscal year 1988 to complete implementation of the three unclassified recommendations. The unclassified recommendations include items relating to (1) fire protection priority construction items, (2) instrumentation and control systems at West Hackberry and Bryan Mound, and (3) an analysis of the adequacy of spare parts needed to draw down the system.

- Pipeline failures have occurred at several SPR sites and appear to be caused by serious erosion and corrosion problems, which may be forerunners of similar problems at other SPR sites. The amount of time, money, and equipment needed to correct the problems depends on the results of further testing, and neither DOE nor the SPR management, operations, and maintenance contractor has developed estimates of what will be required.
- According to DOE, the likelihood of bacterial contamination damaging SPR crude oil is low, but given the dollar investment in and importance of the SPR, DOE is now testing for it. A classified contractor study of SPR contamination issues has been completed, the results of which are not presented in this report.
- DOE has plans for decommissioning the Sulphur Mines oil storage site, but its plans depend on future capacity development and oil fill decisions, and are therefore uncertain regarding the timing of the abandonment. Delaying the abandonment decision will result in the loss of potential savings associated with decommissioning the site.
- DOE's distribution enhancement program provides for matched drawdown and distribution at a rate of 3.57 million barrels per day by the end of fiscal year 1989 at an estimated cost of \$99.7 million. However, current DOE plans for achieving the initially planned 4.5-million-barrel-per-day drawdown/distribution rate are tentative and have not yet been finalized.
- DOE's SPR oil fill rate is legislatively established now for fiscal years 1987, 1988, and 1989 at the highest practicable fill rate achievable subject to the availability of appropriated funds. DOE has proposed a minimum fill rate of 35,000 barrels per day for fiscal year 1988. DOE is proposing to establish this fill rate for fiscal year 1988 in the SPR petroleum account's fiscal year 1988 appropriation and to eliminate during the fiscal year the requirements for a shut-in of the Naval Petroleum Reserve if the necessary fill rate is not maintained. If adopted, DOE's proposed capacity development and fill rate could have several major consequences including delaying completion of a 750-million-barrel reserve, limiting future flexibility for increased oil purchases under favorable conditions, and

limiting DOE's options for closing the Sulphur Mines site.

- Although the SPR is vital to U.S. national security interests, its security policy is different from those associated with DOE weapons or other nuclear facilities. The security forces at nuclear facilities are capable of defeating or delaying attackers whereas SPR guards are only expected to contain intruders on-site until outside help arrives. This requires greater dependence on state and local law enforcement and military forces for assistance in an actual emergency. Although no significant security incidents at the storage sites have been reported, some incidents that may constitute significant security matters have occurred. A recent GAO report¹ showed that DOE's reinvestigation of employees for security clearance purposes has not been timely, and consequently, DOE's procedures for issuing, updating, and terminating security clearances for DOE workers could be improved. These conclusions apply to the SPR program.

In developing data for this report, we analyzed budget data, storage development schedules, oil fill information, pertinent DOE Office of Inspector General reports, pipeline inspection reports and plans, scientific papers regarding microbiological issues, and information on contractor security incident reports obtained from DOE officials in Washington, D.C., and New Orleans, Louisiana. We also conducted discussions with a microbiologist and chemists who were knowledgeable of pertinent scientific issues such as the chemical properties of crude oil and the characteristics of microbes. We reviewed oil price and import forecasts obtained from the Office of Management and Budget, DOE's Energy Information Administration, and Data Resources, Inc., for fiscal years 1988 through 2004.

We discussed the accuracy and reasonableness of the assumptions in the report with responsible agency officials and have incorporated their views where appropriate. However, as requested, we did not obtain official agency comments. As arranged with your offices, unless you publicly announce its contents earlier, we plan no further

¹DOE's Reinvestigation of Employees Has Not Been Timely
(GAO/RCED-87-72, Mar. 10, 1987)

distribution of the report until 14 days from the date of this letter. At that time, we will send copies to the Secretary of Energy and interested congressional committees. We will also make copies available to others upon request.

Major contributors to this report are listed in appendix I.

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ABBREVIATIONS

ARCO	Atlantic Richfield Co.
bbls/day	barrels of oil per day
DOE	Department of Energy
IG	Inspector General
LOOP	Louisiana Offshore Oil Port
MOU	Memorandum of Understanding
PMO	Project Management Office
SPR	Strategic Petroleum Reserve

SECTION 1
INTRODUCTION

=====

THE STRATEGIC PETROLEUM RESERVE

-- WAS ESTABLISHED IN 1975

-- IS PLANNED TO CONTAIN 750 MILLION BARRELS OF OIL

-- CURRENTLY CONTAINS OVER 526 MILLION BARRELS OF OIL

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SPR DEVELOPMENT AND STATUS

The Energy Policy and Conservation Act (P.L. 94-163, Dec. 22, 1975), as amended, authorized the creation of a Strategic Petroleum Reserve (SPR) to store up to 1 billion barrels of oil for use in a supply disruption. To meet the goals of the act, the Department of Energy (DOE) established a three-phase plan to store 750 million barrels of oil by 1989. Although the timetable for achieving this oil inventory has been extended repeatedly, the original objective of a 750-million-barrel SPR has both congressional and administration support.

The SPR currently consists of six storage sites located in Louisiana and Texas. Two sites are full, three are in or nearing the final development stage, and one site is still under construction. Oil storage space is developed through a leaching process that entails pumping fresh water into salt deposits and removing the resultant brine solution. While the storage space is being created, crude oil also can be pumped into the cavern, replacing the brine. As of June 30, 1987, the SPR sites contained over 526 million barrels of oil.

The SPR storage sites are connected by pipeline to the following three marine terminal complexes for crude oil deliveries during site development and for oil drawdown and distribution during an oil supply disruption:

- Seaway complex: The Bryan Mound storage site is connected to Phillips Petroleum Company's terminal (formerly the Seaway terminal) in Freeport, Texas.
- Texoma complex: The West Hackberry and Sulphur Mines storage sites are connected to Sun Oil Company's terminal in Nederland, Texas. The Big Hill storage site, when completed, also will be connected to the Sun terminal.
- Capline complex: The Weeks Island and Bayou Choctaw storage sites are connected to DOE's St. James marine terminal.

SECTION 2

SPR BASELINE ASSESSMENT

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THE SPR BASELINE ASSESSMENT

- WAS A DOE REVIEW OF THE SPR PROJECT MANAGEMENT OFFICE CONDUCTED IN 1983 WHEN THE OAK RIDGE OPERATIONS OFFICE WAS ASSIGNED OVERALL RESPONSIBILITY FOR IMPLEMENTATION OF THE SPR PROJECT

- MADE 170 RECOMMENDATIONS REGARDING IMPROVEMENTS TO SPR'S MANAGEMENT AND OPERATIONS, 6 OF WHICH (3 CLASSIFIED) HAVE NOT YET BEEN COMPLETELY IMPLEMENTED

GAO'S CONCLUSIONS:

CONTINUED ATTENTION SHOULD BE FOCUSED ON ADEQUATE IMPLEMENTATION OF THE RECOMMENDATIONS

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SPR BASELINE ASSESSMENT

DOE's Oak Ridge Operations Office was assigned overall responsibility for implementation of the SPR by the Secretary of Energy on June 15, 1983. As one of his first actions, the Oak Ridge manager established a task force to, among other things, conduct a review of the SPR Project Management Office (PMO) in New Orleans, Louisiana, and compile a report that would establish a baseline of PMO status at the time of this major management transition.

The baseline assessment was completed in October 1983, and the final report included 170 (156 unclassified and 14 classified) recommendations for improving the management and operation of the SPR. PMO's implementation plan for responding to the recommendations was approved by Oak Ridge on January 16, 1984. In June 1986 the DOE Inspector General (IG) issued a report on DOE's implementation of the recommendations. On the basis of a statistically selected sampling of the recommendations, the DOE/IG reported that some of PMO's actions were insufficient to implement adequately the recommendations, and that some of the actions taken did not correct the problems identified. The DOE/IG report noted that of the 46 recommendations reviewed, the actions taken in 8 cases were not sufficient to correct the problem, and in 6 other cases no milestones for completing corrective action had been established.

Although DOE has characterized all 170 recommendations as "closed," we found that 6 (3 classified, 3 unclassified) have not been completed. PMO had previously identified these recommendations and noted that although they had previously been listed as "closed," they had not been completed. The unclassified recommendations include items relating to (1) fire protection priority construction, (2) instrumentation and control systems at West Hackberry and Bryan Mound, and (3) an analysis of the adequacy of spare parts needed to draw down the system.

These recommendations address the need for specific improvements noted during the assessment and include the following:

- The fire protection priority construction recommendation relates to projects such as modifications to control room fire extinguisher systems, additional sprinkler systems, additional fire hydrants and monitors around well heads, and foam sprinkler systems at pump stations.
- The instrumentation and control system recommendations at West Hackberry and Bryan Mound relate to projects such as improvements in telecommunications within site computer systems, and additional verification and retesting of computer software systems added to the existing system.

-- The drawdown spare parts recommendation relates to the identification and acquisition of critical drawdown equipment spares, such as pumps, motors, valves, and associated parts, which would be required to sustain a drawdown in the event that installed equipment failed.

DOE officials told us that items relating to fire protection and instrumentation and control had not yet been completed for a variety of reasons. These included (1) incomplete engineering and design activities, (2) changing requirements in areas such as security, (3) length of time required for contract award and construction, and (4) scheduling completion of some items in subsequent fiscal years, which then are reflected in out-year budgets. DOE, however, considers the recommendation relating to drawdown spare parts closed because, based on an analysis of the requirements, a list was prepared and orders have been placed for \$658,000 worth of spare parts. However, we consider this an open item until the parts have been received.

DOE did not formally prioritize any of the recommendations in terms of their relative importance to overall mission accomplishment, but instead relied on management systems in the various program offices and assistant project managers to determine which work should be done first. PMO officials told us, however, that the implementation plan approved by Oak Ridge in January 1984 included scheduled completion dates that, in their view, implied a prioritization of the tasks.

BASELINE ASSESSMENT RECOMMENDATIONS
HAVE NOT BEEN ADEQUATELY ADDRESSED

Although it has effectively completed many recommendations of the baseline assessment report, we believe that PMO could have more adequately addressed several recommendations. Nearly 4 years have passed since the baseline study was completed, and actions necessary to resolve some high priority recommendations are still incomplete (see table 2.1). In particular, we believe that recommendations relating to fire protection priority construction items and an analysis of the adequacy of spare parts needed to draw down the system should receive continued attention until steps required to finish addressing them are completed. We believe that items such as these are important because they relate directly to matters such as protecting the large investment in oil inventory or ensuring that the system can perform as required in an emergency.

We also believe that any future recommendations of this nature should be formally prioritized to ensure that critical program matters are undertaken before less critical items. The need for this approach is exemplified by the fact that recommendations regarding high priority fire protection construction have not yet been completed, whereas other nonpriority items were completed years ago.

Table 2.1: Unclassified Recommendations That Are Incomplete

<u>Recommendation</u>	<u>Estimated cost to complete</u>	<u>Scheduled completion date (fiscal year)</u>
No. 8: Bryan Mound- West Hackberry Instrumentation Integration	\$ 137,000	1987
No. 22: Identify and Acquire Drawdown Spare Parts	\$ 658,000	1987-88
No. 57: Fire Protection Construction Projects	<u>\$20,562,000</u>	1987-88
Total	<u>\$21,357,000</u>	

Source: DOE.

SECTION 3

SPR PIPELINE INTEGRITY ISSUES

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SPR PIPELINE FAILURES

- HAVE OCCURRED AT SEVERAL SPR SITES
- HAVE BEEN ATTRIBUTED TO CORROSION AND EROSION BY DOE ENGINEERS
- AT WEST HACKBERRY ARE NOT VIEWED BY DOE AS FORERUNNERS OF SIMILAR FUTURE PROBLEMS

IN RESPONSE TO THE PROBLEMS, DOE HAS INITIATED ACTIONS TO IDENTIFY AND CORRECT BOTH SYSTEMWIDE AND SITE-SPECIFIC PIPELINE INTEGRITY PROBLEMS

GAO'S CONCLUSIONS:

THE PIPELINE FAILURES

- APPEAR TO BE CAUSED BY SERIOUS EROSION AND CORROSION PROBLEMS
- MAY INDICATE SIMILAR PROBLEMS AT OTHER SPR SITES

EROSION AND CORROSION APPEAR TO BE CAUSED BY

- OXYGEN IN THE PIPELINE FLUID
- FAILURES IN THE PROTECTIVE COATING APPLIED TO THE PIPES DURING CONSTRUCTION

THE AMOUNT OF TIME, MONEY, AND EQUIPMENT REQUIRED TO CORRECT THE PROBLEMS DEPENDS ON THE RESULTS OF FURTHER TESTING

=====

SPR PIPELINE INTEGRITY IS
A MATTER OF CONCERN

The six SPR storage sites and their three distribution terminals consist of hundreds of miles of oil, brine, and water pipelines. These pipelines have been a critical part of storage cavern development and oil fill activities and will continue to be critical to maintaining the drawdown capability of the SPR sites in the event that the oil is needed during a supply disruption.

A number of pipeline failures and inspection reports noting a high degree of corrosion and erosion activity, however, have raised questions about the general integrity of the pipeline system. Corrosion is the process whereby the metal pipewall is gradually eaten away by chemical action. Erosion, on the other hand, is the process whereby the pipewall surface is worn away by the action of water and abrasive materials, such as rust particles, passing through the pipe. The West Hackberry brine pipeline rupture in December 1985, which closed down site leaching operations, brought into focus the seriousness of the problem and the concern that similar failures could occur at other sites.

MANY EROSION AND CORROSION
PROBLEMS HAVE OCCURRED

In reviewing pipeline inspection reports and other documentation going back as far as 1983, we found that over the years many inspections and tests have revealed pipeline problems. Some examples of the problems noted follow:

- Bayou Choctaw-St. James: A 1983 contractor pipeline study reported that numerous sections of pipe in the Bayou Choctaw-St. James oil pipeline were corroded. A different contractor's report in November 1986 again found anomalies (irregularities) in the Bayou Choctaw-St. James oil line and revealed that the number of grade #1 anomalies (15- to 30-percent pipewall penetration) had increased from 790 in 1983 to 1,024 in 1986. In February 1986, inspections of the Bayou Choctaw site brine lines by divers inside the line identified two areas of corrosion with 25- and 33-percent wall loss, respectively. Replacement of these pipe sections was completed in March 1987.
- West Hackberry-Sun Oil Terminal: In 1984 a contractor inspected the West Hackberry-Sun Oil terminal oil line and found serious corrosion damage, which required a line repair. In May 1986 another contractor inspected the line again and found enough corrosion to cancel test drawdown plans.

- Bryan Mound Site: In July 1984 a Bryan Mound site brine line failed close to where previous ultrasonic testing showed up to 50-percent pipewall corrosion. In addition, the SPR operations contractor's 1986 pipeline report notes that an analysis of the coupons (small metal samples placed in the pipeline to indicate the pipewall's condition) installed in the line revealed above-normal corrosion. In January 1984 the Bryan Mound brine line ruptured in three places because of corrosion. DOE abandoned this section of line and used another existing line instead.

- West Hackberry Site: In March 1985 the SPR operations contractor concluded that ultrasonic and x-ray tests identified corrosion sufficient to warrant some line replacements. In December 1985 the West Hackberry brine line to the Gulf of Mexico ruptured because of corrosion. Additional tests conducted in mid-1986 revealed extensive corrosion and channeling (the formation of furrows or deep grooves in the pipewall), and other sections of the line failed in late 1986.

DOE'S ASSESSMENT OF THE PROBLEM

A DOE engineer in the PMO told us that the primary reasons for pipeline failures are corrosion and erosion. He noted that if oxygen is minimized in the liquid flowing through the pipe, corrosion is minimized. Correspondingly, if the corrosion is minimized, the resulting erosion also is minimized because only minimal iron hydroxide particles are present to abrade the pipe surface, and the protective film that develops inside a pipe will help protect the pipewall from further corrosion. The engineer also told us that scratches on the inside of piping, that occur during manufacturing (once thought to be a cause of the pipeline failures) do not make the piping more susceptible to channeling. He noted that the scratches merely provide a path that is preferential for channeling-type damage if all other conditions are present (such as oxygen in the liquid and the formation of significant corrosion).

In addition, the engineer said the pipeline problems that occurred at West Hackberry are not indicative of the pipeline performance that can be expected at other SPR sites. He noted that the West Hackberry situation was unique because of the length of its brine line: (1) the line is the longest SPR brine line, which allows more rust particles to form along it and dislodge by erosion, and (2) its length allows a greater possibility for oxygen infiltration along the line. As an example of the relative length of the West Hackberry line, he noted that West Hackberry's pipeline stretches 17 miles from the site to the beach, compared with the next-longest SPR brine line, which is 2 miles long at Bryan Mound.

We also reviewed statistics on the number and type of anomalies found in various sections of SPR pipelines and noted an upward trend in the amount of corrosion being detected in some pipes since previous inspections. According to cognizant PMO and operating contractor officials, the anomalies in the West Hackberry-Sun terminal pipeline, are principally in the "moderate" range and represent an increase in external corrosion pits (those corrosion spots occurring on the outside of the pipe). These pits are caused by a breakdown of the external coating that was applied to the pipes during construction. In some instances, the coating had been damaged during construction handling, and in others, the coating developed bubbles or blisters, which caused it to separate from the pipe. In addition, the officials informed us that the increase in reported anomalies at the Bayou Choctaw-St. James pipeline was principally in the "light" range, and that they believe this is a case of imprecisely interpreted instrumentation data, not a significant corrosion problem.

DOE ACTIONS

DOE has initiated several actions to reduce and minimize the kinds of pipeline failures experienced at West Hackberry. Corrosion inhibitors are now used in all SPR oil pipelines. In addition, oxygen scavenging chemicals are used in the West Hackberry brine disposal lines, and their use is planned for the Bryan Mound, Big Hill, and Bayou Choctaw brine lines. The system being installed at Bayou Choctaw is expected to be operational by November 30, 1987. According to PMO officials, design of the Bryan Mound system should be completed by September 1987. The Big Hill system will be operational when the site starts leaching.

Finally, the SPR operating contractor, Boeing Petroleum Services, Inc., has initiated a Pipeline and Piping Assurance Program aimed at (1) identifying the existing conditions of the pipeline system, (2) identifying pipeline deficiencies that warrant correction, (3) making recommendations to DOE regarding required corrective actions, and (4) preparing a corrective action plan. The study will concentrate on site piping at West Hackberry, Bryan Mound, Bayou Choctaw, St. James, Sulphur Mines, and Weeks Island, and will focus on both crude oil and raw water lines, as these are critical to drawdown.

The evaluation will consist primarily of ultrasonic and radiographic tests, to be accompanied by limited excavation and physical inspections at each site. The current plan calls for about 300 test locations selected primarily on the basis of past SPR piping failure experience and engineering projections of the most likely future problem points.

The program's field work is scheduled to start in June 1987 and be completed in February 1989. The cost is estimated at about \$2.1 million. Table 3.1 shows the planned timetable for the program's five segments.

Table 3.1: Timetable for Pipeline and Piping Assurance Program

<u>Program work segment</u>	<u>Period of performance</u>
Piping modifications to provide for raw water line pigging capability at West Hackberry ^a	June - July 1987
Modifications to provide for ultrasonic brine line pigging capability	September - November 1987
Ultrasonic testing	November 1987 - February 1988
Field piping configuration survey	November 1987 - August 1988
Permanent pit construction for future ultrasonic testing	December 1988 - February 1989

^aPigging is the process of running an electronic measuring tool through the pipeline.

Source: DOE.

EQUIPMENT, RESOURCES, AND TIME
REQUIRED TO CORRECT PIPELINE PROBLEMS

Neither DOE nor the SPR operations contractor has developed estimates of the equipment, resources, or time required to correct the pipeline problems indicated by the history of pipeline failures and inspection results. As noted, the SPR operations contractor has initiated a Pipeline and Piping Assurance Program, which is aimed at identifying the equipment, resources, and time required to prepare a pipeline corrective action plan. This program is focused primarily on SPR on-site piping but also includes an evaluation of off-site piping, which has also been plagued with similar problems. The off-site piping is also being evaluated and inspected on the routine, 2-year cycle established for that purpose.

WEST HACKBERRY PIPING FAILURES
ARE POSSIBLE FORERUNNERS OF
SIMILAR PROBLEMS AT OTHER SITES

We believe that the West Hackberry brine line piping failures may be forerunners of similar problems at other sites. First, all sites with brine line piping have had problems. Second, inspections of the Bryan Mound and Bayou Choctaw brine lines as a result of the West Hackberry failure revealed channeling in the Bryan Mound piping and in the Bayou Choctaw brine disposal line. However, DOE officials note that although past piping failures have been a problem, they do not believe that the future potential for problems is as great. They pointed out that the routine use of brine line piping is nearly over since it is used primarily for cavern development and that function is nearing completion at all but the Bayou Choctaw site. In addition, they pointed out that since brine line piping would primarily be used for future refill operations and is not critical for drawdown, brine line failures do not adversely affect drawdown capability.

SPR officials in the PMO believe that the Pipeline and Piping Assurance Program will shed additional light on the matter of on-site piping.

SECTION 4

BACTERIAL CONTAMINATION OF SPR CRUDE OIL

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BACTERIAL CONTAMINATION THAT COULD DAMAGE SPR CRUDE OIL IS POSSIBLE
HOWEVER, DAMAGING BACTERIAL CONTAMINATION OF SPR CRUDE OIL

- IS A DEBATED POSSIBILITY IN THE SCIENTIFIC COMMUNITY
- IS BEING TESTED FOR BY DOE, BUT HAS NOT YET BEEN EVIDENCED

GAO'S CONCLUSIONS:

DOE HAS TAKEN POSITIVE STEPS BY AUGMENTING ITS TESTING PROGRAM
DOE SHOULD MAINTAIN A VIGOROUS TESTING PROGRAM AIMED AT DETECTING
MICROBIOLOGICAL ACTIVITY TO PROTECT THE LARGE OIL INVENTORY
INVESTMENT

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BACTERIAL CONTAMINATION
OF SPR CRUDE OIL

Some researchers have theorized that salt-tolerant (halophilic) bacteria, which consume oil, may have or could contaminate the oil in SPR storage caverns and render it unusable. Cognizant DOE officials told us that periodic testing is conducted to determine whether stored SPR oil remains in a stable and usable condition, and that their tests indicate the stored oil has not been degraded by bacterial contamination.

PMO officials told us that no studies of possible halophilic bacterial contamination had been developed by either the present management, operations, and maintenance contractor, Boeing Petroleum Services, Inc., or its predecessor, POSSI, Inc. However, classified studies of possible bacterial SPR contamination have been performed under a direct DOE contract.

Researchers' Views on Possible
Bacterial Contamination

Researchers we spoke with generally believed that bacteria probably would be present in the SPR oil storage caverns simply because bacteria are found nearly everywhere in the environment and especially in fresh water such as that pumped into the salt caverns during their development and oil drawdown operations. However, researchers differed in their opinions as to whether those bacteria posed a danger to the long-term viability of the oil inventory. According to a knowledgeable Naval Research Laboratory research chemist we spoke with, the general opinion among the world scientific community is that the presence of bacterial organisms in a high-saline environment, such as that found in the SPR caverns, does not pose much of a danger to the oil stored there. He noted that the high salinity discouraged the growth of the kinds of microbes that typically cause problems in the storage of petroleum products and crude oil, and that any bacteria present would likely be dormant. However, no one we spoke with was willing to state categorically that no possibility exists for halophilic contamination to adversely affect the quality of the oil stored in the SPR. A microbiologist with the University of New Orleans told us that he has grown viable halophilic bacteria in high-saline, high-temperature environments. A DOE chemist associated with the SPR program told us, however, that he is not aware of any research that has produced viable hydrocarbon-degrading bacteria under conditions replicating SPR cavern environments.

DOE's Views on Possible
Bacterial Contamination

Cognizant DOE officials, including a DOE chemist responsible for ensuring the quality of stored SPR oil, said they were

confident that bacterial contamination has not had an adverse effect on the oil now stored in the SPR. The chemist noted that although recent tests have evidenced the presence of viable bacteria, DOE has in place an extensive testing program that periodically checks the chemical characteristics of the stored oil to ensure that it is of acceptable quality. Further, he said that DOE has augmented the oil testing program to include microbiological analyses of samples taken from the oil caverns. In addition, the DOE chemist said that samples of the bacteria taken from the oil storage caverns have been encouraged to grow in laboratory conditions, but none has maintained active growth in a high-saline environment (over 30-percent salinity) similar to that found in the oil storage caverns. The DOE chemist pointed out that (1) the preponderance of scientific evidence does not suggest the probability of adverse bacterial contamination in SPR-type environments and (2) no evidence exists of adverse bacterial contamination in European salt-dome storage caverns, which have been used to store crude oil for much longer periods (under similar conditions) than those in the SPR.

Finally, a DOE official told us that in view of the concerns raised regarding the possibility of microbiological contamination, DOE has initiated an international information exchange with European countries that have long-term, underground petroleum storage facilities. This effort is being undertaken in conjunction with a fact-finding tour of many European countries, such as Germany, Finland, and Sweden, that have extensive experience in long-term, underground crude oil and product storage.

GAO'S CONCLUSIONS

Because of the dollar investment in and importance of the SPR to national security, we believe it is prudent for DOE to continue studying the bacterial contamination issue. A vigorous testing program aimed at detecting microbiological activity should be maintained. Further, we believe that the international long-term oil storage information exchange now underway at DOE is an appropriate initiative.

SECTION 5

DOE'S PLANS FOR THE SULPHUR MINES SITE

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BECAUSE OF ITS LIMITED UTILITY, DOE'S PLANS FOR THE SULPHUR MINES SITE

- INCLUDE A PROVISION FOR CLOSING THE SITE
- ARE UNCERTAIN REGARDING THE TIMING OF THE ABANDONMENT
- DEPEND UPON FUTURE OIL FILL RATES AND FURTHER CAPACITY DEVELOPMENT FOR ALTERNATIVE STORAGE OF THE OIL NOW STORED AT THE SITE

GAO'S CONCLUSIONS:

DELAYS IN INITIATING THE ABANDONMENT DECISION

- RESULT IN LOSS OF POTENTIAL SAVINGS ASSOCIATED WITH DECOMMISSIONING THE SITE
- EXPOSE THE OIL INVENTORY INVESTMENT AT SULPHUR MINES TO INCREASED RISK ASSOCIATED WITH THE LACK OF REQUIRED SECURITY AND FIRE PROTECTION IMPROVEMENTS NEEDED AT THE SITE

SULPHUR MINES DECOMMISSIONING

The 26-million-barrel Sulphur Mines, Louisiana, oil storage site was completed in 1983 and placed in a standby status. However, the site is of very limited use for the SPR program because some caverns are so close to the edge of the salt dome that oil can be withdrawn from them only once. Further, Sulphur Mines has the additional disadvantage of having a limited drawdown rate of only 100,000 barrels per day (bbls/day), which would require 260 days for a complete drawdown.

In May 1986 DOE prepared an issue paper that responded to the question of whether the Sulphur Mines site should continue to be used. In that paper, DOE reported the following problems at the Sulphur Mines site:

- It has the highest operating cost per barrel of all the sites.
- Site operation requires the expenditure of about \$14 million over the next 5 years to meet DOE security and fire protection standards.
- Cavern 2-4-5 has a roof leak that requires the oil to be maintained under a unique nitrogen gas cap (a nitrogen gas layer at the top of the below-ground storage chamber) to prevent oil loss. This cap requires higher operating costs for the replenishment of nitrogen, as well as possible additional oil/gas separation equipment costs that may be required during a drawdown.

As a result, DOE has estimated that transferring the oil at Sulphur Mines to one or more other locations and closing the site could save about \$90 million (current dollars) over a 20-year period, but could cost up to \$4.4 million for decommissioning. DOE also determined that the incremental storage costs at a larger site, such as West Hackberry, would be minimal and that transferring the oil would enhance the SPR's overall drawdown capability.

UNCERTAINTY REGARDING WHEN TO DECOMMISSION

Although there are some disadvantages to transferring the oil from Sulphur Mines to a different location (for example, the sunk cost associated with oil transportation), the economics clearly point to this as the preferred decision. Consequently, DOE's development options for the SPR included such a transfer. The timing of the oil transfer, however, is uncertain.

Under DOE's fiscal year 1988 budget proposal, no plans are included for any additional cavern development after fiscal year 1987. Therefore, no capacity would be available to store the 26 million barrels of oil currently at Sulphur Mines until after the year 2000, unless new oil fill were delayed to accommodate the transfer. On the other hand, if DOE receives funds to either continue developing storage space in fiscal year 1988 or resume capacity development in fiscal year 1989, it plans to transfer the oil from Sulphur Mines into storage capacity at Big Hill. In this case, DOE would be able to complete the transfer and abandon the site in fiscal years 1992-93.

Given the storage capacity that would be developed under a continued leaching program, however, it is possible that Sulphur Mines oil could be transferred to the West Hackberry site (instead of the Big Hill site) as early as fiscal year 1988 if new oil fill is restricted to no more than 75,000 bbls/day. An oil fill rate of 100,000 bbls/day or higher for fiscal years 1988 and 1989 would use the available storage space and, under this oil fill condition, abandonment of the site would have to be delayed to the 1992-93 time frame DOE is now considering.

IMPLICATIONS OF DELAYING THE DECOMMISSIONING DECISION

As previously noted, DOE has estimated that closing the Sulphur Mines site could save about \$90 million over a 20-year period. However, the realizable savings decrease the longer the implementation decision is delayed. This is because of the annual site operating expense (approximately \$5 million) and the cost of capital improvements, which will be required if the site remains in operation (approximately \$14 million over the next 5 years). Most of the capital improvements provide for safety and security items which, if not installed, could expose the site to increased risks. Therefore, the longer DOE delays the decommissioning decision, the less savings can be realized by decommissioning.

SECTION 6

SPR DISTRIBUTION ENHANCEMENTS

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DOE'S DISTRIBUTION ENHANCEMENT PROGRAM

- PROVIDES FOR MATCHED DRAWDOWN AND DISTRIBUTION AT A RATE OF 3.57 MILLION BBLs/DAY BY THE END OF FISCAL YEAR 1989 AT AN ESTIMATED COST OF \$99.7 MILLION

GAO'S CONCLUSIONS:

THE DISTRIBUTION ENHANCEMENTS PROPOSED BY DOE

- APPEAR TO RESOLVE MOST OF THE PROBLEMS GAO HAS NOTED IN PREVIOUS REPORTS
- ARE NOT FINALIZED REGARDING ACHIEVEMENT OF THE PLANNED 4.5-MILLION-BARREL-PER-DAY DRAWDOWN/DISTRIBUTION RATE

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SPR DISTRIBUTION ENHANCEMENTS

Currently, DOE does not have the capability to distribute all of the oil that it could draw from SPR oil storage sites primarily because private companies have sold two of the three oil pipelines that were initially designated to carry SPR oil during an oil supply emergency. In response to the problem posed by the imbalance between drawdown and distribution capability, DOE has initiated a distribution enhancements program, which consists of several projects aimed at achieving equality between the SPR drawdown and distribution rates. The program has been developed on the basis of requirements in each SPR distribution system, as follows.

Seaway Distribution System

The enhancement projects in the Seaway complex consist of (1) construction of a 40-inch, 46-mile-long pipeline from Bryan Mound to the Atlantic Richfield Co. (ARCO) common carrier pipeline system at Texas City, Texas, and (2) distribution modifications and contracts with Phillips' Freeport marine terminal and ARCO's Texas City marine terminal for waterborne distribution of SPR oil. The pipeline will have the capability of distributing up to 1 million bbls/day and provide access to eight Houston/Texas City refiners. The distribution modifications and contracts with the terminals provide for two marine terminals on separate shipping channels within the complex, an improvement that reduces reliance on a single terminal and increases the Seaway complex marine distribution capability from 350,000 bbls/day to 650,000 bbls/day. The pipeline and ARCO's terminal enhancements were completed in May 1987; the Phillips terminal enhancements are scheduled to be completed in August 1987. By the end of fiscal year 1987, when all of the enhancements are scheduled for completion, the Seaway complex distribution capacity will match its drawdown capacity of 1.1 million bbls/day. The pipeline cost \$58.3 million. The terminal projects (an estimated total cost of \$10.4 million) are fully funded, and construction is either underway or completed.

A drawdown test of the new pipeline and ARCO terminal enhancements was conducted on June 16 and 17, 1987. During the test, 490,000 barrels of oil were withdrawn from Bryan Mound and sent to the ARCO terminal, which, for the first time, exercised this added distribution capability.

Texoma Distribution System

The Texoma complex enhancement projects consist of (1) construction of a 12-mile pipeline from West Hackberry to the Texas Pipeline Company common carrier system at Lake Charles, Louisiana, and (2) distribution modifications and contracts with an additional marine terminal in Lake Charles. The pipeline will have the

capability of distributing up to 860,000 bbls/day and provides access to three Lake Charles/Port Arthur refiners. The distribution modifications and contracts with the terminal expand marine access to two terminals on separate shipping channels and should increase the Texoma complex marine distribution capability from 1,090,000 bbls/day to 1,290,000 bbls/day. The pipeline is fully funded (an estimated cost of \$20.8 million) with design and land acquisition underway. According to DOE officials, funding for the terminals has been proposed in the DOE fiscal year 1988 budget (an estimated cost of \$2.3 million). The pipeline is scheduled for completion in June 1989 and the terminal projects are planned for completion in September 1989.

Capline Distribution System

The Capline complex enhancement projects consist of (1) construction of a direct pipeline connection between the DOE St. James terminal and the Capline Interstate Pipeline System and (2) distribution modifications and contracts with a commercial marine terminal at St. James, Louisiana. The direct pipeline connection will provide the capability to distribute SPR oil directly to Capline terminal tankage, which will eliminate the potential for conflict with existing Louisiana Offshore Oil Port (LOOP)/LOCAP distribution. The distribution modifications and contracts with the added terminal provide marine access at two terminals on the Mississippi River and increases Capline marine distribution capability from 400,000 bbls/day to 600,000 bbls/day. As of the end of fiscal year 1989, these enhancements should increase distribution capability from the current level of 730,000 bbls/day to a level that will match the complex's drawdown capability of 1.07 million bbls/day. The pipeline is fully funded (estimated cost of \$4.4 million) with design and land acquisition underway. According to DOE officials, funding for the terminals has been proposed in the DOE fiscal year 1988 budget (estimated cost of \$3.5 million). The pipeline is scheduled for completion in December 1987 and the terminal projects are planned for completion in March 1989.

SUMMARY OF SPR SYSTEMWIDE DISTRIBUTION ENHANCEMENT

As a result of the various distribution enhancement projects, the aggregate SPR distribution capability is scheduled to match drawdown capability by the end of fiscal year 1989 when current plans call for the system to be capable of drawing down and distributing 3.57 million bbls/day (see table 6.1). However, as initially envisioned, the SPR was to contain at least 750 million barrels of oil and be capable of sustained drawdown and distribution at a rate of 4.5 million bbls/day. Although it has reaffirmed a commitment to a 750-million-barrel SPR and plans for

an ultimate drawdown/distribution rate of 4.5 million bbls/day, DOE's proposed fiscal year 1988 budget does not include any funds for beginning leaching at the Big Hill, Texas, site so that uncertainty exists about when and how the ultimate rates will be achieved. Current DOE plans for achieving the final system capability are linked to Big Hill development and involve increased waterborne distribution in the Texoma complex. The projects consist of (1) a second Lake Charles terminal and (2) two additional Beaumont-Port Arthur terminals. DOE has tentatively estimated the total cost of these two enhancements at \$60 million, but believes that lower-cost options will be available as plans for these projects are finalized in the future. A DOE official noted that since pipeline demand in the Gulf area is projected to increase, opportunities may arise to better use refiners already connected to the SPR and reduce the need for some of the planned, but more expensive, waterborne distribution alternatives.

Table 6.1: Distribution Enhancement Summary

<u>End of fiscal year</u>	<u>Drawdown capability</u> -- (million bbls/day) --	<u>Distribution capability</u> -- (million bbls/day) --	<u>Distribution as percentage of drawdown</u>
1986	3.330	2.320	70
1987	3.570	3.030	85
1988	3.570	3.270	92
1989	3.570	3.570	100

Source: DOE.

GAO'S CONCLUSIONS

We believe that DOE's proposed distribution enhancements resolve most of the problems we have noted in previous reports and that the enhancements proposed are appropriate, as far as they go. However, we note that in spite of the administration's reaffirmation of the commitment to a 750-million-barrel reserve, uncertainty exists regarding when or how a 750-million-barrel reserve will be achieved. Correspondingly, DOE has not made definite plans for achieving the initially planned, ultimate drawdown/distribution rate of 4.5 million bbls/day.

SECTION 7.

DOE'S PROPOSED OIL FILL PLANS
AND CONGRESSIONAL DIRECTIVE

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THE OIL FILL RATE FOR THE SPR

- CURRENTLY IS ESTABLISHED AT THE HIGHEST PRACTICABLE FILL RATE ACHIEVABLE SUBJECT TO THE AVAILABILITY OF APPROPRIATED FUNDS
- WOULD BE REDUCED TO A MINIMUM OF 35,000 BBLs/DAY UNDER DOE'S PROPOSED FISCAL YEAR 1988 BUDGET, ALTHOUGH THE ADMINISTRATION RECENTLY ANNOUNCED THAT IT WOULD SUPPORT AN OIL FILL RATE OF 100,000 BBLs/DAY IF BUDGET SAVINGS COULD BE FOUND TO OFFSET THE ADDITIONAL COST

GAO'S CONCLUSIONS:

DOE'S PROPOSED DELAY IN LEACHING ADDITIONAL STORAGE SPACE AND ITS REDUCED OIL FILL RATE WOULD HAVE MAJOR CONSEQUENCES, INCLUDING

- DELAYED COMPLETION OF A 750-MILLION-BARREL RESERVE
- A LIKELY HIGHER TOTAL COST FOR A COMPLETED SPR
- LIMITED FUTURE FLEXIBILITY FOR INCREASED OIL PURCHASES IF FAVORABLE CIRCUMSTANCES OCCUR
- LIMITED OPTIONS FOR CLOSING THE SULPHUR MINES STORAGE SITE

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PROPOSED SPR CAPACITY DEVELOPMENT
AND OIL FILL PLANS

The SPR program has been stopped and started several times over the past few years as a result of an ongoing dispute between the administration and the Congress as to how quickly the SPR should be filled. The administration, while declaring support for a 750-million-barrel reserve, has previously imposed a moratorium on developing oil storage capacity and filling the SPR and has deferred spending funds appropriated for these purposes.

On October 21, 1986, the President signed the Omnibus Budget Reconciliation Act of 1986 (P.L. 99-509). The act established two SPR fill-rate requirements. First, it requires DOE to fill the SPR for fiscal years 1987, 1988, and 1989 at the highest practicable fill rate achievable subject to the availability of appropriated funds. Second, it tied the sale of Naval Petroleum Reserve oil to either having 750 million barrels stored in the SPR or maintaining an average fill rate of 75,000 bbls/day.

DOE is filling the SPR at a rate that is expected to average 75,000 bbls/day by the end of this fiscal year. In addition, on the basis of the oil price assumed at the beginning of the year, OMB apportioned all of DOE's unobligated oil account funds except for about \$97 million. In June 1987, OMB apportioned an additional \$81.5 million of its oil account to accommodate the recent oil price changes. In order to comply with the requirement that all available funds be used, DOE is planning to obligate all remaining oil account funds during the last quarter of fiscal year 1987 for oil purchases with deliveries scheduled for the first quarter of fiscal year 1988. DOE's fiscal year 1988 SPR budget proposed net obligations of about \$386 million--about \$221 million for oil purchases and \$165 million for facilities development and management activities. The \$221 million planned for oil purchases is based on a fill rate of 35,000 bbls/day and a fiscal year 1988 oil price of about \$17 per barrel. The funding level and fill, if approved by the Congress, would appear to satisfy the first requirement of the 1986 Budget Reconciliation Act (i.e., a fill rate consistent with the level of funds appropriated). It would not, however, meet the requirement to maintain an average fill rate of 75,000 bbls/day as long as the reserve contains less than 750 million barrels of oil. Therefore, for fiscal year 1988, the administration is proposing (1) to establish in the SPR petroleum account's appropriation an average annual fill rate of not less than 35,000 bbls/day and (2) an elimination of the requirement for a shut-in of the Naval Petroleum Reserve if the necessary fill rate is not maintained.

Although the administration has reaffirmed its commitment to development of a 750-million-barrel reserve, and recently announced

that it would support a fill rate of 100,000 bbls/day if offsetting budget savings can be found, the net obligation of \$165 million for facilities development and management includes no funds for continuing to develop storage capacity after fiscal year 1987. This will freeze total storage capacity at 581 million barrels for an indefinite period. We stated in our May 21, 1987, report, An Analysis of Oil Fill Alternatives (GAO/RCED-87-145BR), that on the basis of DOE's budget, the available permanent storage capacity would remain at 581 million barrels, and the oil inventory would total 546.6 million barrels as of September 30, 1988. The 581-million-barrel storage capacity is sufficient to sustain DOE's proposed 35,000-bbls/day fill rate through fiscal year 1990 and a large part of fiscal year 1991. However, if the administration intends to develop a 750-million-barrel reserve, resumption of oil storage cavern development will be required at some future date.

In order to develop additional capacity to store oil at a rate of 35,000 bbls/day through the end of fiscal year 1991 and beyond, leaching (the process of pumping fresh water into salt deposits and removing the resultant brine to create storage capacity) would have to be resumed in fiscal year 1989 at Bayou Choctaw and at West Hackberry in fiscal year 1991. Leaching at Big Hill would also have to be started in fiscal year 1991. Under this scenario, cavern storage space would be created at a rate commensurate with DOE's proposed 35,000-bbls/day fill rate, and a 750-million-barrel SPR would be achieved in 2004.¹

IMPLICATIONS OF DOE'S PLANS

As previously noted, DOE's proposed budget would, notwithstanding 42 U.S.C. 6240(c) as amended by Public Law 99-509, lower the fill rate requirements for the SPR to not less than 35,000 bbls/day and notwithstanding 42 U.S.C. 6240(d) eliminate for the fiscal year the requirement for a shut-in of the NPR if the necessary fill rate is not maintained. This action, coupled with the fact that DOE has no immediate plans for additional capacity development after fiscal year 1987, will delay completion of a

¹On June 18, 1987, the House Committee on Appropriations reported out H.R. 2712, a bill making appropriations for the Department of the Interior and related agencies for fiscal year 1988. This bill does not adopt DOE's budget proposals for the SPR. Under the bill, the Committee recommends (1) funding levels commensurate with continuing to fill the SPR at an annual average rate of 75,000 bbls/day instead of the 35,000 bbls/day average annual rate proposed in DOE's budget, (2) continuing to leach additional capacity at the West Hackberry and Bayou Choctaw sites and (3) beginning leaching at the Big Hill site. The Committee notes that this recommended leaching program would lead to completion of the entire 750-million-barrel capacity by fiscal year 1992.

750-million-barrel reserve from the planned fiscal year 1992 date until some indefinite time in the future.

In addition to postponing the date at which the SPR would reach the desired total of 750 million barrels, the administration's approach would have several other consequences. For instance, although a 35,000-bbls/day fill rate would decrease expenditures in the short run, it would have the opposite effect over the long run if oil prices rise as forecasts indicate. Furthermore, a moratorium on cavern development will limit future flexibility for increased oil purchases if they were thought advisable as a result of either changes in the international situation or relatively low oil prices.

The slowed development would also limit DOE's options for closing the Sulphur Mines site. (See section 5 for more information on decommissioning the Sulphur Mines site.) Although DOE plans to close the site (thereby realizing cost savings associated with decommissioning), it does not expect to initiate movement of the oil prior to fiscal year 1992, with site decommissioning in fiscal year 1993. The potential availability of excess storage capacity, if leaching were to continue after fiscal year 1987, offers the opportunity to move the oil stored at Sulphur Mines and close the site at an earlier date.

Further, DOE's ability to withdraw large amounts of oil from the SPR and get it into the oil markets is expected to have a dampening effect on future price increases of the type that has resulted from past oil supply disruptions. The SPR drawdown rate is a function of the oil inventory, and the maximum design rate of 4.5 million bbls/day becomes possible as a 650-million-barrel inventory level is reached. Under a maximum fill alternative (about 146,000 bbls/day in fiscal year 1988), this level could be reached in fiscal year 1990, but it would not be reached until fiscal year 1997 under the proposed 35,000-bbls/day fill rate.

Finally, because of the questionable per-barrel SPR oil price estimates used in developing the budget (\$15.14/barrel in fiscal year 1987 and \$16.96/barrel in fiscal year 1988), it is unclear how even the proposed reduced fill rate can be adequately funded within the level of appropriations requested. As of June 23, 1987, DOE was paying about \$19.72/barrel for delivered Petroleos Mexicanos oil. Even if that price prevailed through fiscal year 1988, it would cost DOE about \$2.76 more per barrel to acquire oil than it has budgeted for.²

²The funding levels in H.R. 2712 (the House bill making appropriations for the Department of the Interior and related agencies for fiscal year 1988) assume prices for deliveries for the last half of fiscal year 1987 at \$18.00 per barrel, \$19.80 per barrel for fiscal year 1988, and \$21.80 per barrel for fiscal year 1989.

DOE'S PLANS ARE NOT CONSISTENT
WITH CURRENT LEGISLATION

DOE's plans are not consistent with the current legislative mandate for filling the SPR. As noted, DOE has proposed establishing a minimum 35,000-bbls/day fill rate in the SPR petroleum account's fiscal year 1988 appropriation as opposed to the current requirement to fill at the highest practicable fill rate achievable, subject to the availability of appropriated funds. However, the matter of whether DOE's plans ultimately comply with requirements depends on future congressional action regarding DOE's oil purchase and storage capacity development appropriations.

SECTION 8

SPR SECURITY

=====

THE SPR SECURITY SYSTEM

- IS NOT COMPARABLE WITH, NOR INTENDED TO ACCOMPLISH THE SAME MISSION AS, SECURITY SYSTEMS USED AT NUCLEAR WEAPONS FACILITIES
- IS ACCOMPLISHED BY A COMBINATION OF A PHYSICAL SECURITY SYSTEM, A CONTRACTED SECURITY GUARD FORCE, AND A PROGRAM TO REPAIR OR REPLACE CERTAIN DAMAGED FACILITIES
- IS DEPENDENT ON STATE AND LOCAL LAW ENFORCEMENT AND MILITARY FORCES FOR SUPPORT DURING AN ACTUAL EMERGENCY
- HAS NOT BEEN THE SUBJECT OF ANY REPORTED SIGNIFICANT SECURITY INCIDENTS
- IS CURRENTLY BEING REEVALUATED

SOME SPR EMPLOYEES MAY HAVE SECURITY CLEARANCES OF A HIGHER LEVEL THAN REQUIRED FOR THE TYPE OF WORK THEY DO

GAO'S CONCLUSIONS:

ON AN AGENCYWIDE BASIS, DOE'S PROCEDURES (INCLUDING PROCEDURES USED FOR SPR WORKERS) FOR ISSUING, UPDATING, AND TERMINATING SECURITY CLEARANCES COULD BE IMPROVED

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SPR SECURITY SYSTEM

The SPR was created to store substantial quantities of crude oil in order to diminish U.S. vulnerability to energy supply interruptions and to provide the United States with limited protection from the short-term consequences of any future supply disruptions. The primary mission of the SPR security program is to ensure that the SPR system is capable of providing crude oil, when called upon, without a significant reduction in drawdown capabilities.

A vulnerability study of the SPR, completed by the Aerospace Corporation in 1982, identified five threat categories applicable to the SPR. That study provided the design basis for the construction of the SPR physical security system. Subsequently, a reevaluation of the generic threat policy, conducted by the Oak Ridge Operations Office in 1985, produced a three-category threat policy. The three threat categories allow the level of security to vary depending on the activity relative to the SPR mission. For example, security measures strengthen as the SPR operation progresses from a standby mode to a drawdown mode or if a known potential threat exists.

The SPR's physical security system has been evaluated in several tests and drills. However, some of the results of those evaluations are classified or constitute restricted information and will not be addressed in this report.

THE SECURITY SYSTEM IN PLACE AT SPR SITES

Although the SPR is vital to long-term U.S. national security interests, SPR security policy is based on different considerations than those associated with other important installations, such as DOE weapons facilities. The SPR's escalating threat policy differs from nuclear facilities in that the nature of the materials protected at nuclear facilities dictates the use of different threat policies. Concerns regarding environmental contamination or theft of hazardous and potentially lethal material from nuclear facilities dictates a constantly high-threat security posture. The security forces at nuclear facilities are capable of defeating or delaying an attacking force, whereas the SPR security force is expected to contain an attacking force on-site until assistance arrives.

SPR security is made up of a combination of a physical security system, a contracted security guard force, and a recoverability program.

The physical security system is designed to deter or detect intrusions onto SPR sites, thereby preventing acts of theft, arson, sabotage, or other attempts to destroy SPR property or facilities. The conceptual design for the system was prepared by Sandia Laboratories in May 1980. Components of the system at the SPR sites include a perimeter fence to control access; a main gate guard station designed to function as a security operations center with a geographic alarm display map and video monitors for closed circuit television; main area facilities fenced to form an exclusion zone; and remote area facilities fenced to form an exclusion zone, with a secondary intrusion detection system and a closed circuit television assessment system.

The preliminary cost estimate for installing the system around the first SPR facilities during the early construction period was \$8 million in fiscal year 1979. The actual cost for installing that system was \$13 million. Construction of the physical protection system is an ongoing activity that began in 1981 and continues as new facilities are added to the SPR. The construction of the physical security system around the remaining and phase III crude oil storage facilities will not be completed until all construction activity is completed, including construction of the Big Hill, Texas, storage site. Boeing estimates construction costs for the Big Hill system to be approximately \$4.3 million.

Boeing Petroleum Service, Inc., has contracted for the SPR security guard services through Wackenhut Services, Inc. The security contractor is responsible for providing and managing protective security services and providing the expertise necessary for the effective and timely accomplishment of security requirements. The security guard force (1) protects classified and unclassified documents, government property and facilities (2) conducts property searches and inspections of facilities, personnel, and vehicles and (3) provides a Special Response Team capable of responding to emergency security situations, including terrorist activities, destruction of facilities and attempted theft or sabotage of SPR resources.

Facilities such as the SPR pipelines, associated valves, and other remote structures are not located within or protected by the site perimeter security system. The commercial marine terminal facilities used to distribute the oil withdrawn from storage sites are also not included in the site security system. Accordingly, DOE developed plans to restore such facilities if they are damaged. The restoration provisions are included in a near-term and long-term recovery plan. The near-term plan requires 50-percent recovery within 14 days and 100-percent recovery within 30 days. The near-term plan is supported by two 1-year contracts to provide time and materials for emergency pipeline repair. In addition, some emergency pipeline repair parts are maintained in the SPR emergency inventory. The long-term plan, which is scheduled for implementation in fiscal year 1989 and completion in fiscal year

1991, requires 100-percent restoration of drawdown capability (at all sites except Sulphur Mines) within 15 days and 100-percent restoration of drawdown capability at Sulphur Mines within 30 days.

Although access to commercial terminal facilities is critical to a successful drawdown/distribution operation, DOE is not directly charged with providing the security services that might be needed at the terminal to protect any government-owned equipment and oil and ensure continued operational capability. Three of the four terminal use agreements, however, allow DOE to supplement security at the terminal sites during a drawdown emergency or a security threat with such guards as DOE deems appropriate. At this time, DOE has no written plan for assigning guard forces to secure commercial terminals.

Because of limited guard service resources, SPR security plans are dependent upon emergency assistance on the part of state and local law enforcement organizations and military forces in areas near specific SPR sites. In order to effect these arrangements, SPR officials have established 24 Memoranda of Understanding (MOU) with local, state, and federal law enforcement and military agencies in areas having SPR storage sites. These MOUs generally state that the signatory agencies agree in principle that when called, their response will be timely and consist of law enforcement personnel and equipment needed to counter a threat to the DOE facilities.

In 1986, as a means of establishing a baseline for measuring the effectiveness of protection afforded DOE nuclear facilities and the SPR, DOE began requiring Master Safeguards and Security Agreements for its nuclear and SPR facilities. According to DOE officials, the agreements provide an approach for assessing threats, consequences, and risks associated with a specific facility in order to develop a reasonable and cost-effective protection strategy. In this process, DOE headquarters and the facility establish a binding agreement regarding acceptable levels of risk and the prescribed levels of protection for the facility.

According to an SPR official, the SPR's agreement will address the facility and mission description; interests and targets; consequences; protection strategies; site-specific threats; risk evaluation; and proposed enhancements to the security system. The SPR was originally scheduled to have its draft of the agreement (which Boeing is preparing) finalized in April 1987. However, Boeing requested, and the SPR Program Office approved, an extension until August 31, 1987, because of additional efforts required to complete some analytical computer modeling and develop budgetary requirements.

DOE PROCEDURES FOR ISSUING,
UPDATING, AND TERMINATING
EMPLOYEE SECURITY CLEARANCES

DOE's security clearance program includes (1) prescreening of job applicants to identify those that should not be hired because their conduct, character, and trustworthiness may adversely affect job performance, (2) determining which employees need clearance and at what level, on the basis of their need for access to classified information, material, or facilities, (3) investigating the background of employees for whom clearances have been requested to ensure their reliability and trustworthiness, (4) periodically--at 5-year intervals--reinvestigating cleared employees to ensure their continued reliability, (5) evaluating through interviews and background investigations the seriousness of problems identified through reports of arrests, bankruptcies, etc., (6) terminating clearances for employees who no longer need them, and (7) reviewing through an employee appeal (administrative review) process proposed DOE actions to revoke or deny a clearance. DOE's Director of Safeguards and Security develops policies covering personnel security throughout DOE, but the director and the managers of DOE's field offices are responsible for implementing personnel security programs at their locations.

On the basis of our work done for a prior report, DOE's Reinvestigation of Employees Has Not Been Timely (GAO/RCED-87-72, Mar. 10, 1987), we found that on an agencywide basis, DOE headquarters and some field offices (including the Oak Ridge field office, which processes clearances for the SPR) have been unable to meet DOE goals to reinvestigate security clearances. Clearance reinvestigations are an important element of DOE's overall security program because they are aimed at identifying employees whose lifestyles raise questions about their eligibility for a clearance. Consequently, on an agencywide basis, DOE's failure to perform timely reinvestigations could result in having cleared employees in its work force who may not be suitable for a clearance because they have serious drug, alcohol, or other problems.

Security clearances for the SPR are handled by the Oak Ridge Operations Office's Personnel Clearance and Access Branch. The Personnel Clearance and Access Branch typically issues, updates (through reinvestigations), and terminates security clearances for the SPR's DOE employees, as well as SPR contractor personnel. Although reinvestigation processing statistics for SPR personnel are not maintained separately, a DOE security official told us that SPR security clearance matters are handled in the same manner as those for other DOE employees.

As of June 10, 1987, the Oak Ridge Personnel Clearance and Access Branch had granted the following clearances to the SPR and its prime contractors:

Table 8.1: Security Clearances Issued To The SPR's DOE and Contractor Personnel

<u>Organization</u>	<u>Secret</u>	<u>Top secret</u>	<u>Q-non sensitive</u>	<u>Q-sensitive</u>	<u>L</u>
SPR	84	2	13	6	-
Boeing	223	16	21	-	-
Walk Haydel	223 ^a	-	-	-	-
Fluor Engineer	8	-	-	-	-
Systematic Management	50	-	4	-	-
Boeing Subcontractors	44	247	35	-	1
	---	---	---	---	---
Total	<u>632</u>	<u>265</u>	<u>73</u>	<u>6</u>	<u>1</u>

Source: DOE.

^aAccording to DOE, on June 1, 1987, Walk Haydel requested that security clearances be terminated for 169 of its employees. According to Walk Haydel the terminations would not be finalized until June 15, 1987.

In addition to DOE's failure to perform timely reinvestigations of employees' clearances, it appears that some SPR employees may have security clearances of a higher level than they are required to have for the type of work they do. For example, 19 SPR personnel have been granted Q clearances. Q clearances are typically granted to those persons requiring access to classified information regarding nuclear applications. However, in accordance with DOE order 5631.2A, which sets out the agency's security clearance policy, program, and requirements, Q clearances may also be granted to individuals whose positions have been determined by the Secretary of Energy to require Q clearance authorization. Since no nuclear applications are associated with the SPR, one would expect that very few (if any) SPR employees should require Q clearances. We found that 16 of the 19 employees with Q clearances had been granted the Q clearance after being assigned to the SPR.

In July 1986 DOE headquarters sent guidance to its field offices stating that, among other things, within existing budget and staff, each office should review the need for Q-sensitive clearances and, where appropriate, downgrade them to lower clearances, which are cheaper to obtain. PMO officials told us

that this effort is underway within the SPR work force and that they expect that when completed, the number of Q clearances granted to SPR workers will be significantly reduced.

NO SIGNIFICANT SPR SECURITY
INCIDENTS REPORTED, ALTHOUGH
SOME INCIDENTS HAVE OCCURRED

Pursuant to DOE orders and SPR procedures, Boeing is responsible for reporting significant security incidents to DOE's Safeguards and Security Division in Oak Ridge, Tennessee. Significant security incidents are those involving possible criminal violations and breaches of security interests. Included among these are incidents involving espionage, sabotage, destruction of government property, theft, loss of classified documents, and civil disorders.

According to Boeing, no significant security incidents were reported to Oak Ridge during the period April 1985 (when Boeing became the operations contractor) through February 1987. Boeing reviewed approximately 80 incidents occurring at SPR sites and either initially or upon investigation concluded that the incidents were not significant security matters. A DOE official told us that although PMO agreed with this assessment, it has requested a clarification from the operating contractor regarding the criteria to be used in future security incident reporting.

We reviewed about 30 specific incident reports and noted that several of the incidents that were not reported as significant, in our view, could have constituted a significant security matter. For example, we noted that on one occasion, two unauthorized persons docked a small boat at a terminal adjacent to the SPR St. James terminal facility. The persons were able to gain access to the SPR facility from the adjacent terminal (apparently via an overland route), but were challenged by several SPR security personnel who responded to the intrusion when television monitors at the site revealed their presence.

The intruders, however, refused to be detained by the security personnel and left the premises before local law enforcement personnel arrived on the scene. PMO and SPR security officials told us that the intruders were ultimately allowed to leave the premises because contractor security personnel were uncertain about their authority to involuntarily detain the intruders. DOE has requested that the Chairman, House Committee on Government Operations, introduce legislation that would, among other things, give SPR security personnel authority in certain instances to make arrests without warrants for violations such as trespassing on SPR sites. We will examine this and related issues in a subsequent report, which will address SPR security in greater detail.

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