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United States General Accounting Office
Report to the Chairman, Subcommittee on
Environment, Energy, and Natural
Resources, Committee on Government
Operations
House of Representatives

January 1986

OIL RESERVE

Status of Strategic Petroleum Reserve Activities As of December 31, 1985



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**Resources, Community, and
Economic Development Division****B-208196**

January 29, 1986

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

Dear Mr. Chairman:

On December 9, 1985, the Subcommittee on Environment, Energy and Natural Resources, House Committee on Government Operations, requested that we continue to report on a quarterly basis, at least through fiscal year 1986, on the Department of Energy's (DOE's) progress in filling, developing, and operating the Strategic Petroleum Reserve (SPR) and in complying with the requirements of applicable law. A list of prior SPR quarterly reports is contained in appendix III.

This report discusses events and activities related to the administration's progress in filling, developing, and operating the SPR during the first quarter of fiscal year 1986. Specifically, it notes that:

- DOE added 4.5 million barrels of oil to the SPR, bringing the total to 493.3 million barrels. The oil fill rate averaged about 49,000 barrels per day during the quarter.
- DOE made payments of \$178 million for oil acquisition and transportation, had unpaid obligations of about \$140 million, and had about \$668 million in unobligated funds. (On October 1, 1985, the administration reported a deferral of approximately \$537 million held in the SPR oil account for fiscal year 1986.)
- The storage capacity development program proceeded during the quarter; however, the West Hackberry, Louisiana site's leaching program was stopped in December due to a leak in the brine disposal line. At the Big Hill site in Texas, existing construction contracts have slipped from the September 1985 planned completion dates to January and February 1986.
- DOE held an SPR drawdown test sale and distribution exercise. Approximately 1 million barrels of oil were competitively sold to oil company bidders and subsequently withdrawn from DOE storage sites for delivery.
- The Congress passed a continuing resolution for fiscal year 1986 providing about \$113 million for continued construction of storage capacity as directed by the fiscal year 1985 Supplemental Appropriations Act.

- On December 27, 1985, DOE formally notified cognizant congressional committees that it was planning to submit a deferral of funds for SPR storage facilities development. This deferral would indefinitely delay the proposed awards of new construction contracts at the Big Hill, Texas, and Bayou Choctaw, Louisiana, storage sites and stop all leaching activities as of January 1, 1986.

This report also presents information on (1) the implementation of recommendations made in the DOE Oak Ridge Operations Office's reports on its baseline assessment of the SPR Project Office and its review of allegations about mismanagement or misconduct within the SPR program, (2) DOE's compliance with the Cargo Preference Act of 1954 (46 U.S.C. 1241(b)) during the 1985 crude oil procurement program, (3) DOE's program to analyze the quality of oil in filled storage caverns, and (4) DOE's pipeline construction and marine terminal enhancements to improve the SPR oil distribution system. (See app. I for more details and app. II for supporting figures and tables.)

Objectives, Scope, and Methodology

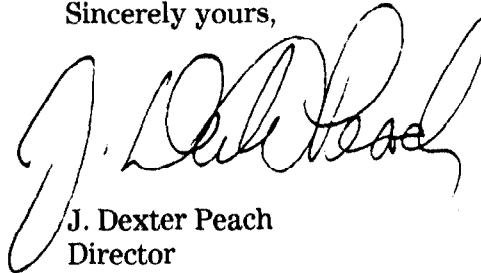
We limited our review, because of the time allowed, to providing primarily statistical information and highlights of major activities that occurred during the period covered. To obtain this information, we reviewed DOE program documents, publications, and studies and interviewed DOE managers and operating personnel responsible for planning and managing activities associated with developing and operating the SPR facilities. We also interviewed employees of DOE contractors and the U.S. Army Corps of Engineers, which is responsible for acquiring pipeline rights-of-way for DOE.

Our review was performed in accordance with generally accepted government auditing standards, except that we did not verify the volumes or quality of oil that DOE received nor the available capacity of SPR storage facilities. We did not do this because the effort required was beyond the scope of this report.

In accordance with your request, we did not obtain official agency comments. However, we provided DOE program officials with a draft of this report and discussed its factual accuracy with them. We made appropriate revisions as necessary.

As arranged with your office, we plan no further distribution of this report until 7 days after the issue date, unless you publicly announce its contents earlier. At that time, we will provide copies to the Secretary of Energy and other interested parties and make copies available to the public upon request.

Sincerely yours,



J. Dexter Peach
Director

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Abbreviations

API	American Petroleum Institute
DFSC	Defense Fuel Supply Center
DOE	Department of Energy
GAO	General Accounting Office
PEMEX	Petroleos Mexicanos
RCED	Resources, Community, and Economic Development Division
SPR	Strategic Petroleum Reserve

Status of Strategic Petroleum Reserve Activities As of December 31, 1985

The Energy Policy and Conservation Act (Public Law 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 the event of an oil import disruption. To meet the act's goals, the Department of Energy (DOE) has been implementing a three-phase plan to store 750 million barrels of oil.

Phase I of the SPR plan involved the storage of about 260 million barrels of oil and is now complete. It consisted of acquiring and modifying for oil storage existing caverns in salt deposits at Bryan Mound, Texas; Bayou Choctaw, Sulphur Mines, and West Hackberry, Louisiana; and a salt mine at Weeks Island, Louisiana, as well as constructing a marine terminal at St. James, Louisiana.

Phase II involves creating new caverns through a leaching program at three of the phase I sites to increase SPR capacity to about 550 million barrels. The leaching program entails pumping fresh water into salt deposits and removing the resultant brine. DOE injects oil into the top of the cavern as the leaching process creates the storage capacity. Phase II leaching was about 95 percent complete as of December 31, 1985, with completion expected in 1987. The administration's decision on December 27, 1985, to stop all cavern leaching activities, however, now leaves the final completion date uncertain.

Phase III, which was scheduled for completion in 1990, was designed to create additional capacity to reach the 750-million-barrel goal by expanding three existing storage sites and developing a new site at Big Hill, Texas. Because of the time needed to develop capacity, activities associated with phases II and III have overlapping schedules. Since the administration has placed a hold on all leaching activities and proposed a deferral of phase III construction funds, the phase III completion date is uncertain.

The SPR storage sites are connected by pipeline to three marine terminals 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 Co.'s terminal (formerly the Seaway terminal) in Freeport, Texas.
- Texoma complex: The West Hackberry and Sulphur Mines storage sites are connected, and the Big Hill storage site—when completed—will be connected to Sun Oil Co.'s terminal in Nederland, Texas.

- Capline complex: The Weeks Island and Bayou Choctaw storage sites are connected to DOE's St. James marine terminal.

The SPR Program Office in Washington, D.C., has overall programmatic management and planning responsibility for achieving the goals and objectives of the SPR program. Responsibility for SPR project management and implementation activities is assigned to the Oak Ridge Operations Office (Operations Office) in Oak Ridge, Tennessee. These activities, as delegated by the Operations Office, are carried out through the Project Management Office (Project Office) in New Orleans, Louisiana. On March 28, 1985, DOE signed a 5-year contract with Boeing Petroleum Services, Inc., to provide the necessary qualified personnel and services to manage, operate, and maintain the government-owned SPR facilities. DOE will retain responsibility for the overall project management and project technical direction, while the contractor will be responsible for the SPR's day-to-day management.

This report discusses activities affecting the SPR that occurred during the quarter ending December 31, 1985, including (1) passage of a fiscal year 1986 continuing resolution to continue developing capacity on December 19, 1985, (2) the administration's notification to congressional committees on December 27, 1985, of its planned deferral of phase III construction funds and the cessation of all leaching activities, (3) activities associated with adding 4.5 million barrels of oil during the quarter, (4) the status of the oil acquisition and transportation account, (5) the cavern-leaching program at the storage sites, and (6) DOE's implementation of a drawdown test sale and distribution exercise. It also provides information about the implementation of recommendations made in the Operations Office's 1983 baseline assessment of the SPR Project Office and review of allegations concerning mismanagement or misconduct within the SPR program. The report further discusses DOE's compliance with the Cargo Preference Act of 1954 (46 U.S.C. 1241(b)), the Project Office's program to analyze the quality of oil in filled storage caverns, and activities related to DOE's proposed SPR oil distribution system enhancements.

SPR Appropriations for Fiscal Year 1986

The Congress did not pass the Department of Interior and related agencies appropriations bill for fiscal year 1986 before it adjourned on December 20, 1985. As a result, SPR construction funds were provided by the continuing resolution for fiscal year 1986 (Public Law 99-190, December 19, 1985), which appropriated \$113 million for continued

development of storage capacity as directed by the fiscal year 1985 Supplemental Appropriations Act (Public Law 99-88, August 15, 1985).¹ Therefore, funding was made available in fiscal year 1986 for the continued construction and development of the 750-million-barrel SPR system, including full resumption of Big Hill and Bayou Choctaw construction activities and continued leaching at Bryan Mound and West Hackberry. Congress appropriated no additional funds for oil acquisition stating that DOE had adequate funds in the SPR petroleum account to fill the SPR to 500 million barrels. However, the continuing resolution did permit the Secretary of Energy, in cooperation with the Secretary of Agriculture, to barter surplus Commodity Credit Corporation commodities for crude oil to be delivered to the SPR.

Plans to Defer Funds for SPR Development

On December 27, 1985, DOE's Assistant Secretary for Management and Administration formally notified cognizant congressional committees that DOE was planning to submit a deferral of funds for SPR storage facilities development. According to the Assistant Secretary's notification, this deferral is specifically related to delaying procurement activities for the Big Hill site construction and to capacity development at other sites. The Assistant Secretary stated that such a delay is appropriate at this time to afford the administration an opportunity to consider options for future SPR funding, particularly so in light of the deficit reduction targets in the Gramm-Rudman-Hollings Act and the fiscal constraints faced by DOE. DOE plans to submit a deferral reflecting this decision to the Congress with the President's fiscal year 1987 budget request in early February. Although the exact amount of money that will be deferred had not been determined as of December 31, 1985, SPR Program Office officials told us that the deferral would include funds deferred in fiscal year 1985—an action subsequently rejected by the Congress.

On December 30, 1985, the SPR Program Office issued financial and technical guidance implementing this deferral policy to the Oak Ridge Operations Office. The guidance indefinitely delayed all new phase III construction contracts at the Big Hill and Bayou Choctaw storage sites; stopped all leaching activities as of January 1, 1986; and suspended actions associated with oil purchases beyond January 31, 1986, until

¹The administration's fiscal year 1986 budget proposed deferring the use of about \$1.1 billion of funds that were available in fiscal year 1985—\$270.7 million for SPR storage capacity development and \$827 million for oil purchases. In the fiscal year 1985 Supplemental Appropriations Act, however, the Congress disapproved the deferral of \$270.7 million for SPR storage capacity development construction and about \$290 million for oil acquisition, leaving \$537 million for oil acquisition deferred.

further guidance is provided. The guidance memorandum also included instructions to cancel previously planned enhancements to improve the oil distribution system at the Sun Oil Co. terminal. Program Office officials told us, however, that this cancellation was based on an engineering decision as to the need for the enhancements rather than on budgetary considerations. The Operations Office was also requested to develop a new transition plan describing all actions required to put SPR facilities in a standby status by January 31, 1986.

SPR Oil Fill Activities

DOE reported that 4.5 million barrels of oil were added to the SPR during the quarter ending December 31, 1985, bringing the total SPR inventory to 493.3 million barrels. The average SPR oil fill rate for the quarter was about 49,000 barrels per day.² (See fig. II.1 and table II.1 for further information on SPR oil acquisition and fill activities.) All of the oil delivered during the first quarter of fiscal year 1986 was purchased under DOE's 1981 contract with Petroleos Mexicanos (PEMEX), the Mexican national oil company. As we stated in our September 1985 quarterly report,³ DOE intended to meet all of its fiscal year 1986 oil requirements of 11 million barrels by purchasing the oil directly through its PEMEX contract. This is in contrast to the prior years' purchasing program when DOE relied on the Defense Fuel Supply Center (DFSC)—a Department of Defense agency—to buy most of its SPR oil. Given DOE's suspension of oil purchase activities after January 31, 1986, however, the quantity and source of future oil supplies is uncertain.

Of the 493.3 million barrels of oil in storage as of December 31, 1985, 39 percent was sweet (low sulfur) crude, 49 percent was sour (high sulfur) crude, and about 12 percent was a combination of lower quality crude oils. (See table II.1 for SPR oil quality specifications.) However, the sweet/sour crude oil mix is expected to change slightly if DOE continues to meet its oil purchase objective as planned through its PEMEX contract, which expires on August 31, 1986. The addition of another 6.5 million barrels of Mexican sour crude oil would change the oil type ratios to about 39 percent sweet crude, 50 percent sour crude, and 11 percent a combination of lower quality crude oils.

²The 1985 Supplemental Appropriations Act amended the Energy Policy and Conservation Act to eliminate the requirement for a specific daily rate of fill as long as the SPR will reach 500 million barrels by the end of the fiscal year without restricting future sales of oil from the Elk Hills Naval Petroleum Reserve.

³Status of Strategic Petroleum Reserve Activities as of September 30, 1985 (GAO/RCED-86-37, Oct. 15, 1985).

Status of SPR Oil Acquisition and Transportation Account

According to DOE, its oil acquisition and transportation account (or SPR petroleum account) provides funds for (1) SPR oil procurements, (2) associated transportation costs such as pipeline, tanker, and marine terminal activities, (3) the operations and maintenance of the SPR terminal at St. James, Louisiana, (4) U.S. Customs duties, and (5) other miscellaneous costs, such as DFSC administrative costs, associated with acquiring and transporting the oil. A DOE official told us that in the event of an SPR oil drawdown, this account would also fund the federal cost of withdrawing the oil from the storage caverns and transporting it to the point where private purchasers would take title.

During the quarter, DOE made payments of \$178 million for oil acquisition and transportation. Program Office personnel stated that as of December 31, 1985, DOE had unpaid obligations of about \$140 million and unobligated funds of about \$668 million. On October 1, 1985, the administration deferred SPR oil account funds of approximately \$537 million for fiscal year 1986. These funds had been previously deferred in fiscal year 1985. (See table II.2.)

Storage Site Activities

Cavern leaching activities at the West Hackberry and Bryan Mound sites continued throughout most of the quarter as scheduled. Both sites shut down for 2 weeks of planned maintenance and West Hackberry stopped all leaching activities on December 8, 1985, because of a break in the brine disposal pipeline. At Bayou Choctaw, the ethane transfer between DOE and Allied Chemical Corporation caverns⁴ was completed in July 1985, and the legal cavern title exchanges were made this quarter. At the Big Hill site, current construction contracts were not finished this quarter as planned; the contract to provide the initial on-site construction has slipped to February 14, 1986, and the contract for the off-site construction of the water-intake facility is now scheduled for completion on January 17, 1986.

West Hackberry

The West Hackberry leaching program operated without major problems during October and November 1985, but on December 8, 1985, the brine disposal line to the Gulf of Mexico was discovered to be leaking and the West Hackberry leaching program was shut down. Up to that point the

⁴According to Project Office personnel, in December 1982, Allied Chemical Corp. settled its lawsuit against DOE, which had used federal condemnation procedures to obtain Allied Chemical's land for the Bayou Choctaw SPR storage site. As part of the settlement, DOE agreed to leach a cavern with at least 4.5 million barrels of usable capacity and then exchange it for a 10-million-barrel cavern that Allied Chemical used to store ethane.

leaching had created about 2.8 million barrels of oil storage capacity for a total capacity of 166 million barrels. Of the 16 phase II caverns, 6 are full (containing a total of 59.9 million barrels of oil), 5 are in the final-fill stage (containing a total of 42 million barrels with an additional capacity of about 8 million barrels of oil), 4 are in the leach-fill stage (containing about 6.5 million barrels), and 1 is in the leaching-only stage. (See table II.3.) About 25 million barrels of gross cavern space remain to be leached.

A Project Office official told us that on December 8, 1985, West Hackberry's 26-mile, 36-inch brine disposal line developed a leak at about the 9-mile point. As a result, the West Hackberry leaching program was shut down and remained in a shut-down status as of December 31, 1985. According to Program and Project Office officials, the corrosion that caused the pipe leak could extend to other sections of the line and require a major repair effort. However, they added that a decision would not be made until an ongoing assessment and analysis of alternatives for correcting the situation is completed.

Our last three quarterly reports⁵ discussed the phase II cavern in the leaching-only stage that was taken out of service for testing and evaluation because of a leaching problem. The test completed through last quarter disclosed no cavern well leaks. The work during this quarter included well casing changes (completed December 18, 1985) and the start of low-pressure testing. In January 1986, nitrogen will be injected into the cavern to test for roof leaks. According to a Project Office engineer, the initial test results indicated that leaching could resume for this cavern in April 1986 unless precluded by the current hold on all cavern leaching activities.

The 2-week shutdown for site maintenance was completed on October 13, 1985, as scheduled. The work included replacing valves, performing electrical preventive maintenance, removing and replacing pumps and motors requiring overhaul, and repairing brine lines. The West Hackberry DOE site manager told us that the maintenance performed during a shutdown is not the type of maintenance that can be done while the site is in its normal operating mode.

⁵Status of Strategic Petroleum Reserve Activities as of June 30, 1985 (GAO/RCED-85-149, July 15, 1985), and Status of Strategic Petroleum Reserve Activities as of March 31, 1985 (GAO/RCED-85-111, Apr. 15, 1985). For the September 1985 report, see footnote 3.

Our September and June 1985 quarterly reports discussed DOE's plans to investigate a potential problem point in the crude oil pipeline between West Hackberry and the Sun Oil Co.'s marine terminal in Nederland, Texas. On November 12, 1985, Boeing Petroleum Services, Inc., awarded a firm-fixed-price contract for this work to Triangle Engineering and Constructors, Inc., for about \$78,000. However, a Boeing procurement official said that work would not begin until after the crude oil test sale is completed in mid-January 1986. (The test sale at West Hackberry and other SPR oil storage sites is discussed later in this report.)

The instrumentation and control work, started in July 1985 to convert the West Hackberry raw water-intake structure from a manned to an unmanned operation, continued throughout the quarter. A Project Office official informed us that a modification to the specifications for the raw water-intake structure extended the completion date for the contract from January 6, 1986, to April 12, 1986.

Bryan Mound

The Bryan Mound leaching program operated without major problems during the quarter, creating about 5.3 million barrels of oil storage capacity. The site now has a total available storage capacity of 200 million barrels with about 190 million barrels of oil in storage. All phase II leaching was completed last quarter, with the last four of the phase II caverns needing about 6 million barrels of oil to complete the final oil-fill stage. In accordance with the December 30, 1985, Program Office guidance, all leaching activities were stopped on December 31, 1985. Leaching is about 74 percent complete at the four phase III caverns.

The 2-week maintenance shutdown was completed November 9, 1985, as scheduled. The work included electrical preventive maintenance, valve replacement, piping repairs, removing and replacing pumps and motors requiring overhaul, and cleaning the brine pond.

Bayou Choctaw

The Bayou Choctaw cavern exchange between Allied Chemical Corp. and DOE, which we have discussed in prior quarterly reports, was completed December 6, 1985. DOE exchanged a cavern with at least 4.5 million barrels of usable capacity for a 10-million-barrel cavern owned by Allied Chemical where ethane was being stored. Our September 1985 quarterly report discussed the ethane transfer and the beginning of Allied Chemical's tests in the 10-million-barrel cavern to assure oil storage capability. Allied Chemical encountered difficulty in stabilizing the cavern pressure in its 10-million-barrel cavern. Although this

problem has not been fully resolved, a Project Office engineer informed us that DOE judged the pressure stabilization problem not to be serious enough to reject the cavern because a nitrogen test had demonstrated that the cavern does not leak. According to the Project Office engineer, additional work is planned to prepare the cavern for oil fill in early 1987.

On December 18, 1985, a firm-fixed-price contract was awarded to Dilco, Inc., for \$4.285 million to drill a second well and complete the surface piping construction for the phase II cavern newly acquired from Allied Chemical. The work is planned to begin about February 17, 1986.

DOE planned to award a contract to install the necessary surface piping to start leaching the phase III undeveloped cavern around April 1986. The administration's planned deferral of construction funds includes this project; therefore, DOE plans to suspend any further development activity on this cavern.

In our September 1985 quarterly, we reported that a hydrostatic test was completed on the 37-mile crude oil pipeline between Bayou Choctaw and the St. James marine terminal. A Boeing report on the test issued in November 1985 recertified the pipeline's integrity but lowered its maximum operating pressure by over one-half of its original design requirements.⁶ The revised operating pressure provides a safety factor of one-and-a-half times the maximum calculated pipeline pressure required for a 480,000-barrel-per-day drawdown, plus some margin for any higher start-up pressure flows that might occur during a maximum oil drawdown effort. The Boeing report indicated that the pipeline's operating pressure was lowered because some pipeline joints showed a wall thickness loss of greater than 50 percent. (We discussed this matter in our December 1983 quarterly report.⁷) Since exact wall thickness could not be determined, a hydrostatic pressure test was required to prove integrity at a lower rating.

Sulphur Mines

During the quarter, Boeing completed a study evaluating the present and future use of the Sulphur Mines storage site, which is currently in a

⁶According to the SPR Project Manager for Operations, this does not create a problem because the pipeline was initially designed and installed to accommodate oil withdrawals from a much larger site—and therefore at much higher pressures—than is currently planned for Bayou Choctaw.

⁷Status of Strategic Petroleum Reserve Activities as of December 31, 1983 (GAO/RCED-84-92, Jan. 13, 1984).

standby readiness mode. Since August 1984, DOE has been reviewing different options on how best to utilize this site, including (1) retaining it as an independent operating SPR site, (2) operating it as a satellite site of West Hackberry which is nearby and connected by pipeline, (3) removing the stored oil for transfer to other SPR storage sites, preferably to West Hackberry, and (4) abandoning the site after an SPR drawdown. According to DOE, the Sulphur Mines site was only expected to support one complete fill/drawdown cycle. The site was developed even though it is an exception to DOE's requirements for SPR sites, which require multiple cycles of complete oil drawdown and subsequent refill. About \$74 million has been invested in facilities at Sulphur Mines; approximately 26 million barrels of oil are stored there.

In the Program Office's current study on the optimal utilization of Sulphur Mines, Boeing has provided basic technical and cost information on site operation and maintenance, capital improvements, and transfer of the stored oil to other SPR storage locations. The Program Office will use the Boeing input to complete its evaluation and formulate decisions on the use of the Sulphur Mines site by late January 1986.

Big Hill

During the quarter, DOE continued developing the phase III Big Hill storage site. On-site construction of the central facilities, leaching systems, piping, and instrumentation for the first 5 of 14 planned caverns at Big Hill (called "I-A" contract) is now approximately 94 percent complete. Off-site construction of the raw water-intake structure (called "I-B" contract), which will provide fresh water to the site for leaching storage cavern space, is approximately 92 percent complete. Neither of these construction contracts was completed by the end of fiscal year 1985 as originally planned. At the time of our work, a February 14, 1986, completion date was scheduled for the I-A construction contract, and the I-B contract had slipped to January 17, 1986. A DOE project official at Big Hill told us, however, that he is not optimistic that either date can be met.

As we stated in our last SPR quarterly report, the 1985 Supplemental Appropriations Act restored the fiscal year 1985 construction funding that the administration had deferred. Consequently, on August 23, 1985, DOE made preparations to continue with site construction activities as called for before the moratorium was proposed in the administration's fiscal year 1986 budget submission.

The I-B contract that was modified in May 1985 to cancel certain equipment procurements and to place some of the raw water pumping equipment into storage instead of having it installed as planned was changed again in August 1985 to require the equipment to be purchased and installed. DOE's construction contractor at Big Hill has cited these changes as the reason for delaying the off-site construction completion date from August 1985 to January 17, 1986. The contractor stated that when the cancelled equipment was re-ordered, the equipment manufacturer could not meet the earlier delivery dates, thus delaying the contract completion date. The I-A construction contract was not modified by DOE, but because of construction problems DOE agreed to a slip in completion to February 14, 1986. A DOE project official at Big Hill told us that if construction contracts are not substantially completed by their respective January 17 and February 14, 1986, completion dates, the construction contractor may be liable for liquidated damages to the U.S. government at a rate of \$10,000 per day, per contract.

The remaining contracts needed to complete the Big Hill construction continue to be delayed. Subsequent to congressional rejection of the proposed deferral of SPR construction funds in the fiscal year 1985 Supplemental Appropriations Act, DOE reissued invitations to bid on three construction contracts to prepare the Big Hill site for cavern development and oil fill. DOE had intended to award these contracts in early 1985, but had stopped action on them in December 1984 in anticipation of the funding deferral included in the administration's fiscal year 1986 budget proposal. With the restoration of SPR funding in August 1985, the prior invitations were updated and prepared for issuance. On October 21 and November 6, 1985, respectively, invitations for bids were reissued for constructing (1) the raw water-intake and brine pipelines and an electrical transmission line from Big Hill's substation to the off-site raw water-intake structure and (2) the crude oil pipeline. Also, the invitation for bids for surface piping construction for nine caverns, issued November 28, 1984, and subsequently cancelled, was reissued November 6, 1985. DOE planned to award contracts for all three of the above-mentioned procurements by February 1, 1986, but suspended award of these contracts in its December 30, 1985, guidance to the SPR Operations Office. DOE was also planning to issue a request for proposals on March 17, 1986, for the Sun Oil Terminal connection to the Big Hill crude oil pipeline. However, this has been cancelled by DOE's planned deferral of SPR funding.

The delays resulting from the administration's proposed moratorium also caused additional problems at Big Hill. According to a DOE official at

Big Hill, some manufacturer warranties on delivered equipment have lapsed, and it is anticipated that all warranties will expire before the equipment is put into operation. During this quarter, DOE decided that extending current or expired warranties would be cost-prohibitive and that a rigorous equipment maintenance program with an increase in available spare part stocks would be a more cost-effective program.

During this quarter, Gulf States Utilities did not "energize" or connect the Big Hill electric power substation to the high-voltage transmission line as planned on September 1, 1985. A January 1986 completion date is projected to finish constructing the substation. The substation is scheduled to be energized prior to January 31, 1986, and the existing low-voltage electrical distribution line will be terminated. The substation will provide power for acceptance testing of installed equipment as well as power to operate the Big Hill facility during its phase III development activities.

The planned start date for leaching storage caverns at Big Hill further slipped from its pre-moratorium date of January 1, 1986. In August 1985, after the proposed moratorium was rejected, DOE rescheduled the leaching to begin on December 1, 1986. However, a DOE project management report states that this start date has been delayed to April 1, 1987. According to the report, this latest slip is due to the delayed completion of construction at Big Hill and the need for 2 additional months of integrated system tests. According to DOE's Big Hill project manager, tests of system equipment are critical because some of the Big Hill equipment has been "sitting around on-site untested" since the fall of 1985. The planned completion of leaching at Big Hill would also be delayed by about 6 months, finishing by October 1990. However, DOE's termination of all leaching activities and its planned deferral of development at Big Hill make even these dates uncertain.

Drawdown Test Sale and Distribution Exercise

As we reported in June 1985, the Energy Policy and Conservation Amendments Act of 1985 (Public Law 99-58, July 2, 1985) required that DOE conduct a drawdown and distribution test of 1.1 million barrels of SPR oil within 180 days after the bill's enactment. The test is intended to demonstrate that SPR oil can be withdrawn from the storage caverns, sold, and distributed successfully. The legislation states, however, that the oil should not be sold at less than 90 percent of market price and that the Secretary of Energy may cancel the sale if there are insufficient acceptable offers to purchase the SPR oil. During this quarter, bids were

received, 1 million barrels of crude oil were sold, and some oil delivered. The final deliveries were scheduled to be completed in January 1986.

On October 2 and October 7, 1985, DOE published notices to prospective bidders in the Federal Register and Commerce Business Daily, respectively, announcing the test sale and inviting oil industry participation, recommendations, and attendance at a pretest sale conference. That conference was held in New Orleans, Louisiana, on October 21, 1985. Twenty-three companies representing major and independent oil companies, refiners, traders, and non-oil industry associations were represented. DOE personnel, including the Deputy Assistant Secretary for Petroleum Reserves, presented the test sale processes and procedures that included standard sales provisions, minimum bid price determination, crude oil quantities, marine terminal information, transportation modes involved, instructions for submitting offers, scheduling information, and delivery and documentation processes.

DOE issued a sale notice on November 18, 1985, which formally began the test sale. On December 3, 1985, DOE began awarding sales contracts to the successful oil company offerors. In the test sale, 17 companies made offers constituting 35 separate bids. The average sales price was about 95 percent of the established comparable market price. One million barrels of oil were sold for about \$28.9 million. (The weighted average purchase price for a barrel of sweet and a barrel of sour oil was \$30.36 and \$27.89, respectively.) Table II.4 lists the successful oil company bidders for this test sale by SPR storage location and method of oil delivery, type of oil, and oil purchase price.

By December 31, 1985, about 444,000 barrels of oil had been delivered to the successful bidders; by January 17, 1986, the remaining test sale oil was to be delivered to the designated marine terminals where the successful bidders will receive their purchases for transport to refineries by either pipeline or vessel (tanker or barge). According to Project Office officials, the completed transfer of oil to the successful bidders has gone very well. After the test sale is completed, DOE will receive evaluations from the successful offerors and combine this information into a report, along with DOE's own evaluation and observations of the test sale and distribution exercise. DOE also plans to solicit information on the test sale from parties who requested information on the sale but did not bid, and from parties who did not submit successful bids. A Program Office official told us that this evaluation should provide valuable information on improving the entire sales process.

A Boeing official involved in the test sale and drawdown activities told us that the crude oil flow for the December 1985 test sale deliveries, from the storage sites to the marine terminal tanks (the custody transfer points), was routine; sufficient quantities were scheduled for transfer to achieve the design drawdown rates. The drawdown rate achieved for each movement was determined by using the site operations model to project the peak hourly flow rate achieved during the entire oil movement period into a daily rate. Boeing and DOE officials stated that the West Hackberry crude oil movement to the Sunoco terminal tanks (678,000 barrels over 17.5 hours) achieved a projected daily drawdown rate of over 1.2 million barrels, and the Weeks Island oil movement to St. James terminal tanks (743,000 barrels over 35 hours) achieved a projected daily drawdown rate of 592,000 barrels.

As we reported in our previous quarterly report, we believe that the SPR drawdown and distribution exercise could test bidding and purchasing processes but would not fully test the SPR's drawdown and distribution capability. According to a Program Office official, the test sale was not intended to provide any further assurances that DOE could sustain a prolonged drawdown. The official stated that DOE had this assurance before the test sale based upon computer simulations and limited-scope drawdown tests. Nevertheless, he added, the immediate benefits of DOE's test sale have shown that (1) the sales process worked, (2) industry became involved in DOE's sale and distribution process, (3) the public and private sectors were given confidence that SPR oil could be withdrawn and sold during an oil emergency, and (4) areas exist where the sales process can be fine-tuned.

Other Issues

During our review, we also obtained information on DOE's (1) implementation of the recommendations made in the Operations Office's baseline report and its report on allegations about mismanagement or misconduct within the SPR, (2) DOE's compliance with the Cargo Preference Act, (3) the Project Office's program to analyze the oil in filled storage caverns, and (4) DOE activities concerning proposed SPR oil distribution system improvements.

Implementation of Operations Office Recommendations

After it was assigned responsibility for SPR project management and direction in June 1983, the Operations Office evaluated the status of the SPR Project Office and in October 1983 issued a baseline assessment report. This report made 170 recommendations which predominantly

sought to redirect overall SPR priorities, realign Project Office and contractor responsibilities, and implement existing DOE procedures. The Project Office had proposed implementation actions for all 170 recommendations by June 30, 1985, and the Operations Office had approved these actions.

In March 1984, the Operations Office issued its report on allegations of mismanagement or misconduct in the SPR program. The report made 25 recommendations, which the Project Office is implementing. By June 30, 1985, the Project Office had also proposed implementation actions for all 25 recommendations and the Operations Office had approved the actions.

Our June 1984 quarterly report⁸ stated that the Operations Office modified its follow-up system to indicate whether a recommendation required no further follow-up (category A), a follow-up was required and would be accomplished through the appropriate SPR management system (category B), or a follow-up was required and its progress would be reported in follow-up reports (category C).

In June 1985, the Project Office published its first monthly and quarterly reports used in tracking to completion the implementation of the approved proposed actions for recommendations in categories B and C. (The last of the category A recommendations was approved and completed by the Project Office during the quarter ending June 30, 1985.) As of December 31, 1985, the follow-up reports were tracking the implementation actions for 35 recommendations (25 in category B, 10 in category C) from the baseline assessment and 6 recommendations (2 in category B, 4 in category C) from the allegation report.

During the last 6 months, the Project Office approved and completed actions on 37 recommendations from the baseline assessment and 4 recommendations from the allegation report. The Operations Office rejected five of the Project Offices' proposed actions, which would have moved five recommendations from category C to category A. According to an Operations Office official, the Operations Office did not concur with the sufficiency of the Project Office's proposed actions. The Project Office must now resubmit alternative actions for these five recommendations for approval.

⁸Status of Strategic Petroleum Reserve Activities as of June 30, 1984 (GAO/RCED-84-182, July 13, 1984).

Cargo Preference Act Compliance

SPR oil deliveries are subject to the Cargo Preference Act of 1954. The act requires that the SPR program, as a government procurement activity using ocean-going vessels, transport at least 50 percent of the oil in commercial U.S.-flag tankers. DOE and the Maritime Administration, the agency in the Department of Transportation that administers the Cargo Preference Act, agreed to use long-ton miles for SPR oil shipments to measure compliance. (Long-ton miles combine both the amount of oil carried and the distance the oil is moved.)

From 1977 through 1984, U.S.-flag tankers accounted for 49 percent of total long-ton miles used to transport SPR oil. (Since the beginning of 1981, U.S.-flag tankers have accounted for 53 percent of the long-ton miles.) DOE estimates that U.S.-flag tankers accounted for 50 percent of the long-ton miles in 1985.

During 1985, the total long-ton miles used to transport SPR crude oil cargoes fell from previous levels. DOE officials estimated that SPR cargoes accounted for only 17.5 billion long-ton miles compared to an annual average of 55.6 billion long-ton miles between 1981 and 1984. According to a Program Office official, the drop in 1985 long-ton miles for both U.S.-flag and foreign-flag tankers from previous years was caused by a shift in DOE's crude oil purchases from the Middle East to "closer-in" North Sea and Mexican oil sources. One apparent result of this recent trend has been a decrease in SPR oil transportation charges.

Analysis of Oil in Storage Caverns

Our March 1984⁹ and March 1985 quarterly reports discussed the storage cavern inventory and integrity control program, in which oil samples are taken and analyzed for each cavern about 4 months after it has been filled and every 5 years thereafter. The oil samples are taken at six different cavern levels and are divided so that half is sent to the National Institute for Petroleum's laboratory at Bartlesville, Oklahoma, for analysis, and half is retained at the storage site.

Our March 1984 quarterly report listed 11 caverns that DOE had sampled and for which it had received analysis results. Our March 1985 quarterly report listed an additional 14 caverns that DOE had sampled but had received analysis results for only 6 of these caverns. Since March 1985, DOE has sampled an additional three caverns and the Weeks Island mine. Results of these analyses have been received for all but two of the

⁹Status of Strategic Petroleum Reserve Activities as of March 31, 1984 (GAO/RCED-84-184, Apr. 13, 1984).

caverns sampled. The results showed that the oil sampled was within the specific gravity and sulfur content ranges that DOE has established for SPR oil types. Table II.5 shows the results of the laboratory analyses.

SPR Oil Distribution Enhancements

In our June, September, and December 1984 quarterly reports, we discussed DOE's proposal to correct problems in the SPR oil distribution system caused when Texoma Pipeline Co. and Seaway Pipeline, Inc., sold their interstate crude oil pipelines. DOE had estimated that designing and constructing enhancements to improve the SPR distribution system would be completed by the end of fiscal year 1987 and cost approximately \$97.2 million. The terminal enhancements were estimated to cost \$12 million; the balance would be used for pipeline-related costs. During this quarter, DOE began contract negotiations for capital improvements and services at one marine terminal serving the SPR and planned to begin contract negotiations in the next quarter for the other terminal.

In an October 29, 1984, letter, DOE notified the chairmen and ranking minority members of the congressional subcommittees responsible for SPR oversight and appropriations of its proposal to reprogram \$49.5 million to implement the distribution system improvements. A reduced amount of \$42.3 million for fiscal year 1985 reprogramming was subsequently approved. According to DOE, the remaining funding needed to complete the distribution enhancements would be requested in subsequent budgets as required.

Distribution enhancements for the Seaway complex consist of constructing a 40-inch, 42-mile pipeline from Bryan Mound to Texas City, Texas, and modifying the Phillips Petroleum Co.'s marine terminal at Freeport, Texas, and the ARCO tank farm and marine terminal at Texas City. Land acquisition for the new pipeline is in progress, and the Corps of Engineers is performing real estate appraisals and negotiating with land owners. In September 1985, the United States Steel Corporation was awarded a contract to provide the steel pipe for the planned pipeline.

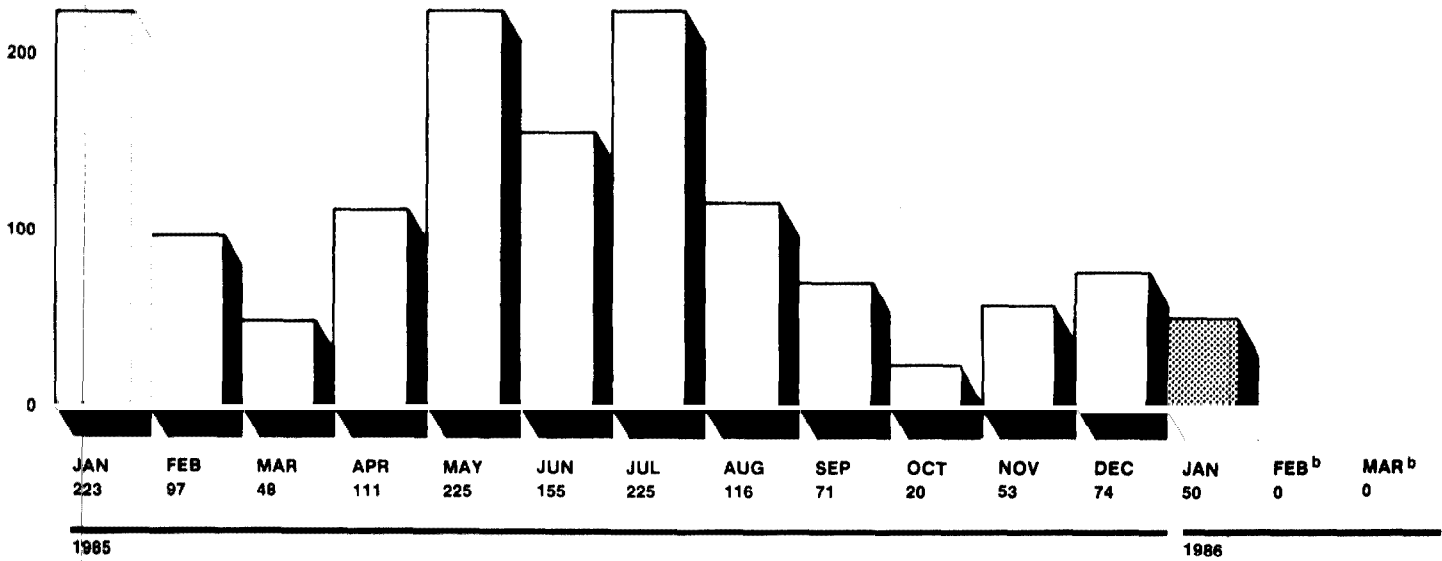
During this quarter, DOE agreed to a reassessment of its Seaway complex enhancements and reduced the crude oil pipeline diameter from 42 inches to 40 inches and rerouted the pipeline to reduce its length. DOE estimates that the changes will save approximately \$5.6 million in project costs. Also during the quarter, DOE and ARCO began negotiations on a terminal enhancement contract. An award date to ARCO is currently

scheduled for January 30, 1986. The contract negotiations between Phillips and DOE for the Seaway terminal enhancements will begin next quarter; an award date for the Phillips contract is scheduled for March 14, 1986.

Figures and Tables on the Status of The Strategic Petroleum Reserve

Figure II.1: Average Daily SPR Oil Receiving Rate^a

300 Volume (barrels per day) in thousands



Actual
 Projected

^a Daily receiving rate for January 1986 is based on DOE projection of future deliveries and is subject to change.

^b Oil purchases beyond January 31, 1986, have been suspended.

**Appendix II
 Figures and Tables on the Status of the
 Strategic Petroleum Reserve**

Table II.1: SPR Oil Deliveries by Crude Type As of December 31, 1985

	Type I^a	Types II-V^b	Type VI^c	Type VIa^d	Maya^e	Total^f
Volume delivered (millions of barrels)	241.3	192.4	31.4	16.6	11.6	493.3
Percentage of total oil delivered	49	39	6	3	2	99^f

^aHigh-sulfur crude (from 0.5 to 1.99 percent sulfur content) with an American Petroleum Institute (API) gravity range of 30 to 36 degrees. Type I oil includes Arabian Light and Isthmus crudes. The oil industry uses degrees of API gravity to measure an oil's specific gravity. API gravity measures the mass of a fluid relative to water and ranges from 10 degrees for very heavy crude to 45 degrees for very light crudes.

^bHigh-quality crudes with a low sulfur content (maximum 0.5 percent sulfur content) and an API gravity range of 30 to 45 degrees. These types include some North Sea and West African crudes.

^cType VI was established for Alaskan North Slope crude, an intermediate-sulfur crude (maximum 1.25 percent sulfur content) with an API gravity range of 26 to 30 degrees.

^dType VIa was established for the Maya/Isthmus blend under the PEMEX contract. The blend is a high-sulfur mixture with an API gravity of at least 28 degrees.

^eMaya crude is a lower quality oil having a maximum sulfur content of 3.5 percent and an API gravity of at least 22 degrees. As of April 1984, Maya crude was no longer being acquired as part of the PEMEX contract.

^fNumbers do not add up to 100 percent because of rounding.
 Source: DOE.

Appendix II
 Figures and Tables on the Status of the
 Strategic Petroleum Reserve

**Table II.2: Status of the SPR Oil
 Acquisition and Transportation Funds
 As of December 31, 1985^a**

Dollars in millions	
Funds made available	Amount
Carryover from fiscal year 1981	\$ 1,806
Fiscal year 1982 appropriations	3,684
Fiscal year 1983 appropriations	2,074
Fiscal year 1984 appropriations	650
Fiscal year 1985 appropriations	2,050
Total made available	10,264
Funds used or committed	
Fiscal year 1982 payments	3,687
Fiscal year 1983 payments	1,641
Fiscal year 1984 payments	2,329
Fiscal year 1985 payments	1,621
Estimated fiscal year 1986 payments ^b	178
Estimated DOE unpaid obligations as of 12/31/85 ^c	140
Total used or committed	9,596
Estimated unobligated funds at DOE ^d	\$ 668

^aThe Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35, Aug. 13, 1981) established the SPR Petroleum Account, effective October 1981, to pay for petroleum acquisition and transportation. This is an off-budget account.

^bAmount consists of DOE's actual reported payments through November 1985 and DOE's estimated payments for December 1985.

^cUnpaid obligations represent funds that have been committed to pay for fiscal year 1986 oil deliveries under the first PEMEX contract, or are obligated to DFSC for PEMEX oil transportation costs. DFSC estimates that of the funds obligated to it, about \$7.6 million is available as of December 31, 1985, for future costs.

^dOn October 1, 1985, the administration reported a deferral of \$537 million for fiscal year 1986.
 Source: DOE and DFSC.

**Appendix II
 Figures and Tables on the Status of the
 Strategic Petroleum Reserve**

**Table II.3: Status of SPR Underground
 Capacity for Crude Oil Storage As of
 December 31, 1985^a**

Millions of barrels			
Storage facilities	Permanent capacity planned	Capacity available	Capacity filled
Phase I sites:			
Bayou Choctaw	46.0	46.0	45.8
Bryan Mound	66.0	67.1	64.4
Sulphur Mines	26.0	26.4	26.1
Weeks Island	73.0	73.0	72.5
West Hackberry	49.0	49.2	47.9
Total	260.0	261.7	256.7
Phase II sites:			
Bayou Choctaw	10.0	.0	.0 ^b
Bryan Mound	120.0	121.2	115.3
West Hackberry	160.0	116.8	108.4
Total	290.0	238.0	223.7
Phase III sites:			
Bayou Choctaw	10.0	.	.
Bryan Mound	40.0	11.4	10.3
West Hackberry	10.0	.	.
Big Hill	140.0	.	.
Total	200.0	11.4	10.3
Tanks and pipelines	.	.	2.6
Total for SPR	750.0	511.1	493.3

^aCapacity for oil storage is less than gross cavern capacity leached.

^bA newly leached cavern with 4.5 million barrels of usable capacity has been exchanged for an existing 10-million-barrel cavern owned by Allied Chemical Corp. at the Bayou Choctaw site.

Source: DOE.

**Appendix II
 Figures and Tables on the Status of the
 Strategic Petroleum Reserve**

**Table II.4: Information on SPR Test Sale
 and Distribution Exercise**

Storage site	Barrels Purchased	Type of oil	Successful bidder	Oil purchase price per barrel^a	Method of delivery
Bryan Mound	300,000	Sour	Phillips	\$28.09	Vessel
Weeks Island	300,000	Sour	Phillips	27.69	Vessel
West Hackberry	100,000	Sweet	La Gloria Oil & Gas Co.	30.35	Pipeline
West Hackberry	200,000 ^b	Sweet	La Gloria Oil & Gas Co.	30.05	Vessel
Bayou Choctaw	60,000	Sweet	Conoco	31.25	Pipeline
Bayou Choctaw	10,000	Sweet	Amoco	30.61	Pipeline
Bayou Choctaw	30,000	Sweet	Marathon	30.56	Pipeline
Total	1,000,000				

^aThe weighted average purchase price for a barrel of sweet and a barrel of sour oil were \$30.36 and \$27.89, respectively.

^bThree hundred thousand barrels of oil had been offered for sale. According to the test sale's guidelines, offerors were required to bid for at least 200,000 barrels in all vessel deliveries.
 Source: DOE and GAO.

**Table II.5: Results of Laboratory
 Analyses of Filled SPR Caverns and
 Mine**

Storage site	Cavern number	Type of oil	Degrees API gravity	Percent sulfur content
Bayou Choctaw	18	Sweet	36.1	0.38
Weeks Island	Mine	Sour	29.8	1.38
West Hackberry	103	Sweet	37.1	0.46
	104	Sweet	36.8	0.17
	105	Sweet	37.6	0.20
	107	Sweet	37.5	0.21
	108	Sweet	37.5	0.45
Bryan Mound ^a	107	Sour	33.0	1.50
	109	Sour	33.1	1.53
	110	Sour	32.8	1.57

^aBryan Mound caverns 102 and 103 have been sampled but results are not complete.
 Source: DOE.

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2. Status of Strategic Petroleum Reserve Activities as of September 30, 1982 (GAO/RCED-83-29, Oct. 15, 1982).
3. Status of Strategic Petroleum Reserve Activities as of December 31, 1982 (GAO/RCED-83-93, Jan. 14, 1983).
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6. Status of Strategic Petroleum Reserve Activities as of September 30, 1983 (GAO/RCED-84-11, Oct. 14, 1983).
7. Status of Strategic Petroleum Reserve Activities as of December 31, 1983 (GAO/RCED-84-92, Jan. 13, 1984).
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9. Status of Strategic Petroleum Reserve Activities as of June 30, 1984 (GAO/RCED-84-182, July 13, 1984).
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14. Status of Strategic Petroleum Reserve Activities as of September 30, 1985 (GAO/RCED-86-37, Oct. 15, 1985).

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