The original documents are located in Box 9, folder: "Strategic Petroleum Reserve – Plan (2)" of the Frank Zarb Papers at the Gerald R. Ford Presidential Library.

Figure V-3

POSSIBLE CRUDE OIL FLOWS FOR A 1980 IMPORT INTERRUPTION OF 3.3 MILLION BARRELS A DAY

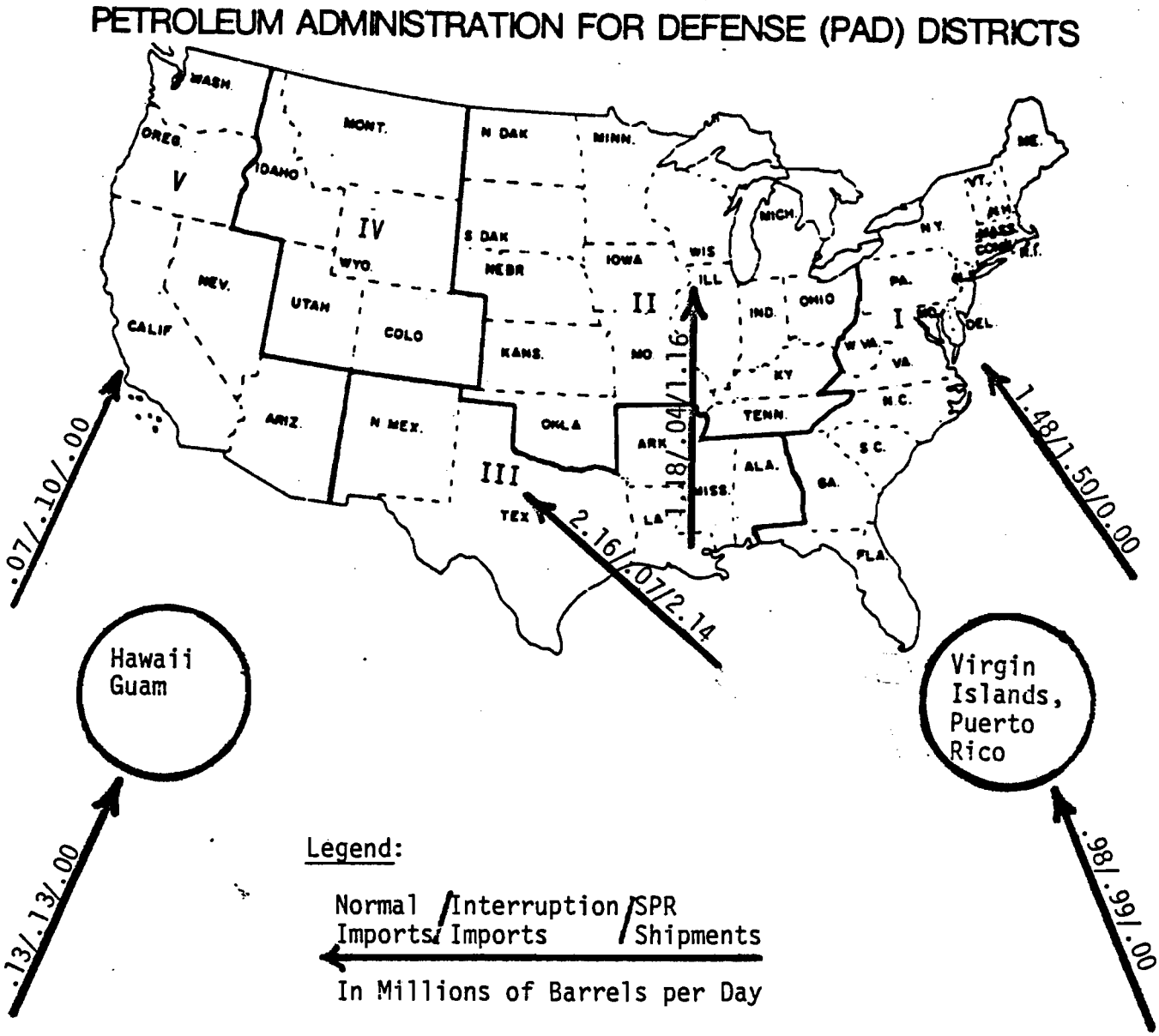


Table V-9

1980 U.S. - FLAG TANKER FLEET FOR SPR MOVEMENTS

	Thousands of Deadweight Tons (MDWT)	
Ships of draft suitable for East Coast and Gulf of Mexico		11,713
Alaska to West Coast/Gulf trade	6,067	
Gulf to Atlantiic trade	2,688	
Other domestic trade	1,166	9,921
Available for SPR		1,792
Gain in capacity for running domestic fleet at capacity and normal speeds		800
		2,592

Source: MARAD

the domestic shipping requirements associated with withdrawals from the SPR. Since 1950, more than 100 such waivers have been granted. There would be virtually no delay in obtaining such a waiver.

MARAD noted, additionally, that there may be as much as several million DWT of American-owned foreign-flag tankers of suitable size for the drawdown and that many of these ships are likely to be available and waiting for an opportunity to carry oil in the event of a major embargo. If necessary, however, the Secretary of Commerce could requisition U.S.-owned foreign-flag vessels, under authority of Section 902 of the Merchant Marine Act of 1936, to carry the Reserve crude.

Although it is not possible to determine which tankers will be carrying fuel oil imports in the future, ships now carrying the petroleum trade from Caribbean ports to the U.S. East Coast have been examined. In early 1976, ships under 21 different flags were participating in the trade. Ships under flags of convenience (Liberia and Panama) were carrying 56 percent of the shipments. Greece was the next largest car-

rier, with 13 percent. The United Kingdom flag carried 5.8 percent, and Norway and Italy accounted for 3.2 percent each. U.S. flag had 3.7 percent. The remaining was spread among flags of 13 countries.

This indicates that the trade is not now dominated by any country or group of countries likely to force the ships to pull out of the trade in the event of an interruption. The ships under flags of convenience are primarily U.S.-owned and could be effectively under U.S. control if necessary. In view of this, there appears to be very little risk that a major portion of the ships carrying imports from the Caribbean refineries would be lost during an interruption.

Conclusions Regarding Steady-State Interruption Impacts

Based on the steady-state supply analysis, it is concluded that it is not necessary to store crude oil or refined products within the Regions or noncontiguous areas to satisfy the steady-state supply requirements of FEA Regions 1 through 4 or other contiguous and noncontiguous areas of the country.

- No additional withdrawal from industry product inventories would be required to meet steady-state demands.
- Industry product inventories could be maintained above critical levels as long as SPR supplies last and are drawn at the full interruption rate less any reduction in consumption.
- Sufficient refinery capacity will be available to process crude oil from SPR supplies, to meet product demands.
- Transportation resources are forecast to be more than adequate to deliver SPR crude to refineries and resulting finished products from refining centers to satisfy regional and noncontiguous area product demands.

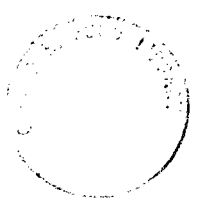
FURTHER INFORMATION ON EXPECTED DEMAND AND SUPPLY FOR SPECIFIC REGIONS

FEA Regions 1 through 4 Overall

Expected 1980 product demand in FEA Regions 1 through 4 (combined) is forecast at about 9268 MB/D or about 47 percent of total U.S. demand. This demand would be primarily supplied by about 4900 MB/D of products transferred from Gulf Coast refineries in Texas and Louisiana by pipeline and ships plus approximately 500 MB/D from refineries in the U.S. territories of Puerto Rico and the Virgin Islands. The next largest source of supply for these products would be refining capacity forecast to be located within the Regions themselves which will produce about 2700 MB/D of products. The remainder of the demand, or about 1200 MB/D, would be imported products primarily from Caribbean refineries in the Bahamas, Netherland Antilles, Venezuela and Trinidad.

The crude supplies to the refineries serving FEA Regions 1 through 4 range from 40 to 100 percent imported. The local refineries in Regions 1 through 3 run about 90 percent imported crude while the Caribbean refineries, with the exception of Venezuela, process 90 - 100 percent imported crude, most of it from Venezuela.

During an interruption of 3.3 MMB/D of petroleum, roughly half of the normal crude oil imports would be lost and replaced by crude from the SPR. Under the assumption of retaining access to the Caribbean refineries, very little refining capacity would be lost, (as discussed in Chapter III), hence only crude oil is needed in the SPR to supply all normal demands. To save transportation costs, most of the remaining (non-interrupted) crude imports to the Gulf Coast would be diverted by industry to the refineries in Regions 1, 2 and 3 and the Caribbean. Then almost all of the SPR crude would be processed in the Gulf Coast and the Midwest. Up to 10 percent of the SPR crude might be routed to the Caribbean refineries. In this way, the refineries supplying FEA Regions 1 through 4 would be assured a source of crude supply to run at normal feed rates to supply products through normal distribution systems.



FEA Region 1

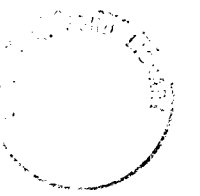
Expected 1980 demand in FEA Region 1 is approximately 1500 MB/D. This demand would be met by about 250 MB/D of locally refined products plus about 260 MB/D of product imports and 980 MB/D of domestic product receipts from outside of Region 1. Roughly half of these domestic receipts (480 MB/D) is expected to be shipped in from the Gulf Coast directly. The remaining 500 MB/D of domestic receipts are expected to come from the Virgin Islands (100 MB/D) and from Regions 2 and 3 (400 MB/D). The imported products will come mostly from the Caribbean and Canada and will be primarily residual fuel.

A proposed 250 MB/D local refinery - in Pittston, Maine - will most likely process imported oil. If interrupted, its supplies would be made up by diversion of non-interrupted imported crude normally shipped to the Gulf Coast. If this refinery is not built, a similar refinery is expected to be built either on the Gulf Coast or in the Caribbean to supply this demand. In the alternate location, its crude supply is protected by the same crude diversions. Outside receipts of products would then increase to meet Region 1 total demand.

FEA Region 2

Expected 1980 petroleum demand in FEA Region 2 is estimated at about 2800 MB/D. This demand will be met by about 1800 MB/D of net domestic product receipts plus about 660 MB/D of local refinery output and about 500 MB/D of product imports, less shipments of roughly 200 MB/D to FEA Region 1. Almost all of the forecast domestic receipts will come from the Gulf Coast, both by tanker and pipeline. Product imports will consist mostly of residual fuel from the Caribbean.

The coastal refineries, comprising about 80 percent of the regional capacity, run primarily imported crude. If interrupted, it would be replaced by expected industry diversions from remaining imported crude to the Gulf Coast. Interrupted crude supplies to the Caribbean refineries, which furnish imported products, would also be replaced by diversions from the Gulf Coast and, if needed, SPR crude. The interrupted crude to the Gulf Coast, plus the crude lost through diver-



sions, would be entirely replaced by SPR crude to the Gulf Coast refineries.

FEA Region 3

Projected 1980 demand in FEA Region 3 is approximately 2350 MB/D. This is estimated to be supplied by 1200 MB/D of locally refined products, 1100 MB/D of domestic products and 230 MB/D of product imports, less 200 MB/D sent to Region 1. Most of the imported products will be residual fuel from the Caribbean. Almost all of the domestic products will come from Gulf Coast refineries by pipeline and tanker.

About 80 percent of the refining capacity in Region 3 is located on the coasts of Pennsylvania and Delaware, and processes primarily imported crude. If interrupted, these imports would be replaced by diverting non-interrupted crude imports from the Gulf Coast to provide an assured supply. Most of the crude supply to the small refineries in Western Pennsylvania and West Virginia is local crude. The lost crude supply to the Gulf Coast and Caribbean refineries will be made up from the SPR so that all refineries operate at normal rates and can continue normal product supplies.

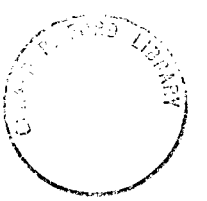
FEA Region 4

Forecast 1980 petroleum product demands amount to about 2700 MB/D in FEA Region 4. Of this total, about 1950 MB/D will come from the Gulf Coast via pipeline and tankers, 550 MB/D from local refineries and about 200 MB/D will be imported products, primarily residual fuel from the Caribbean.

Most of the regional refining capacity is located on the Mississippi coast and in Kentucky. These refineries run about 40 percent imported crude which, if lost, would be replaced by SPR crude.

Supplies for Northern Tier Area

Canada currently supplies the U.S. with crude oil, principally via the Lakehead Pipeline, and serves refineries from Montana to Pennsylvania. Canada has announced its intention to phase out its exports of oil to the U.S. There are various industry proposals to solve the problem of replacement raw materials for Northern Tier refineries, which range from new pipelines from the West Coast to expanding pipeline



capacity from the Gulf Coast area. At this time, no final decisions have been made by industry.

Regardless of how these oil supplies are replaced for normal supplies, it is incumbent upon the SPR Program to be able to serve the Northern tier in the event that their evolving imported supply sources are interrupted. The currently planned storage facilities for the SPR in the Gulf Coast would be able to provide oil to the Northern Tier refineries if pipeline connections are made for imports from either the Gulf Coast or the West Coast. The final size and location of the SPR facilities will be influenced by industry's future decisions in solving this Northern Tier problem.

NONCONTIGUOUS AREAS

FEA has considered the practicability of storage in each of the noncontiguous areas, considering potential supply interruptions, cost, cost-benefit relationships, and environmental impact comparisons with central storage. These factors and the demand and supply conditions in the several areas are discussed below.

Cost Comparison

Newly constructed steel tanks are the only viable storage option relevant for each of the noncontiguous areas, since their geology is not conducive to underground storage and adequate existing tankage is not available. Table V-4 estimated steel tank costs at $10.57 per barrel which compares with $2.24 for salt caverns, a difference of $8.33. Since centralized storage can provide as much assurance of product supplies at the consumer level in each of these areas under the 3.3 MMB/D interruption scenario, the added expenditure for noncontiguous storage would buy little, if any, benefit.

For a given level of expenditure for an SPR, any additional expenditures for noncontiguous storage facilities would decrease the quantity of oil which could be stored. If each noncontiguous area received a proportional share of the Reserve based on its petroleum demands in relation to total national demand, it would increase the cost of storage facilities by an estimated $131 million. An additional expendi-

ture of $131 million would reduce the total quantity that can be stored in the SPR by approximately 10 MMB.

The loss of protection from a reduction of 10 MMB in the SPR could cost the Nation $150 to 200 million in GNP loss, with little or no benefit in return.

Environmental Impacts

Steel tank storage in noncontiguous areas has not been assessed to date on a site-specific basis. Programmatic environmental impacts indicate, however, that significant degradation could occur due to:

- Hydrological effects;
- Air quality deterioration; and
- Climatological occurrences.

The hydrological effects could result from short-term water quality degradation and ground water contamination due to dredging or rain run-off water contaminated with spilled oils and suspended solids.

Fugitive hydrocarbon emissions occurring during filling could degrade air quality if equipment is not well maintained. More of these emissions would occur during tank and marine tanker filling than from underground storage because of the reduced requirement for venting of underground storage.

Crude oil storage above ground presents 10 times the air quality hazard of distillate in similar storage because of its higher volatility. Hydrocarbon emissions escape to the air due to the floating roof necessary for aboveground tank storage of crude, but not required for underground storage. Accidental oil spills and fires are a greater hazard with tanks and ships than with underground storage.

Tank storage in the noncontiguous areas would be more vulnerable to climatological occurrences such as hurricanes and other tropical storms than would salt caverns in the Gulf Coast area. Significant wind and water damage frequently occurs in the noncontiguous areas due to these causes.

With steel tanks the only viable option for storage in each

of the noncontiguous areas, the environmental assessment is essentially the same in all of them.

Puerto Rico

Puerto Rico is forecast to have approximately 280 MB/D of refinery capacity on line in 1980. An estimated 27 percent of the refined products produced in Puerto Rico will be supplied to U.S. mainland markets, primarily gasoline and distillate fuel oil. All of Puerto Rico's crude supply is imported, 14 percent from Venezuela and 86 percent from other producing countries.

Puerto Rico is located approximately five days steaming time by tanker from candidate Gulf Coast storage sites. During a supply interruption, the shortfall, mainly crude oil and refinery feedstocks, could be replaced without interruption by diversion of continuing U.S. imports, or from mainland Gulf Coast sites.

With approximately one percent of the forecast 1980 national demand for petroleum, the location of one percent of the SPR (5MMB) in Puerto Rico would cost $41.7 million more than storage in salt caverns.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in Puerto Rico are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within Puerto Rico.

Virgin Islands

The Virgin Islands are forecast to have approximately 900 MB/D of refinery capacity in 1980. An estimated 94 percent of the refined products, mainly residual oil, of the Virgin Islands will be exported to U.S. and other markets. Crude oil for refinery feedstocks comes from foreign sources similar to those supplying Puerto Rico.

The Virgin Islands are located approximately five days steaming time by tanker from candidate Gulf Coast storage sites. During a supply interruption, the petroleum shortfall would consist primarily of crude oil raw materials. It could be replaced by diversion of continuing U.S. imports, from crude normally stored locally, or from mainland Gulf Coast

sites, with no run-out of crude supplies or refined products at the primary storage level.

The Virgin Islands would qualify for five-tenths of a percent or about three MMB of noncontiguous storage under a proportional location strategy. The additional cost would be $25 million compared with Gulf Coast storage.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in the Virgin Islands are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within the Virgin Islands.

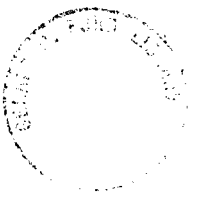
Hawaii

Located along primary Pacific Ocean trade routes, Hawaii is forecast to have approximately 110 MB/D of refining capacity in 1980. It will provide refined products for local use, much of the bonded fuels for international air and ocean traffic, some products for other areas in the Pacific and approximately 27 MB/D to the mainland West Coast.

Indonesia supplies 80 percent of Hawaiian crude imports with only a limited quantity coming from OAPEC sources and some from as far as Venezuela. Hawaii is located approximately 17 days steaming time from the Gulf Coast storage sites. In case of an import interruption, the shortfall could be replaced by diversion of continuing crude imports intended for the West Coast, from crude normally stored locally, to some extent from Prudhoe Bay shipments, or from Gulf Coast sites.

The possible use of tankers for local storage has been suggested by MARAD and others. Sufficient information is not currently available, however, with respect to the costs and potential environmental risks with tanker storage. Discussions have been held with the U.S. Coast Guard to identify specific environmental risks and the means for their abatement, but the current state of knowledge does not support serious consideration of tanker storage at this time. Since no suitable rock formations are known to exist on the island, the only practical storage facilities would be steel tanks, with the environmental problems discussed earlier.

Hawaii would qualify for approximately one percent or 5 MMB of noncontiguous storage under a proportional location strat-



egy that would cost an estimated $41.7 million more than salt cavern storage.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in Hawaii are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within Hawaii.

Guam

Guam is on the western fringe of the U.S. petroleum supply distribution system with ocean access to foreign sources of crude. Approximately 30 MB/D of refinery capacity is forecast for 1980, although the local refinery operators are known to be considering some expansion in conjunction with a proposed shift to Prudhoe Bay crude. Middle East crude is now used entirely by the one island refinery, with about 95 percent of its output supplied for U.S. military requirements.

Guam is approximately 30 steaming days from the Gulf Coast storage sites, although their resupply during an interruption would more likely come from diversions than from the SPR. If refinery operations are shifted to use Alaskan crude, the impact of any potential interruption would be decreased. Moreover, the Defense Department could issue rated orders to require large oil companies to supply the refinery.

Guam would qualify for 0.5 MMB (.1 percent) of noncontiguous storage to support local demand under a proportional location strategy that would cost an estimated additional $4.16 million in SPR facilities.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in Guam are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within Guam.

American Samoa

Located in the South Pacific nearer to Australia than to the U.S., American Samoa receives imports of diesel fuel, kerosene and jet fuel, primarily from the Bahamas. Additional

imports come from Hawaii and the U.S. mainland. Samoa has no refineries.

It is approximately 24 days steaming time by tanker from the Gulf Coast storage sites. During a U.S. supply interruption, little shortfall would be expected considering the source of their imports. Any redistribution required would probably consist of shipments from Hawaii and the Bahamas. American Samoa would qualify for about .1 MMB (.02 percent) of noncontiguous storage under a proportional location strategy. Additional program expenses are estimated at $.8 million.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in American Samoa are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within American Samoa.

Pacific Trust Territory

Comprised of the Caroline, Marshall, and Mariana island groups and consisting of more than two thousand atolls and islands (96 inhabited), the Trust Territory is spread across nearly eight thousand square miles of ocean area. There are no refineries in the territory and product imports consist mainly of distillate fuel and diesel oil from the Philippines and Guam Terminal.

Any product shortfall which might appear during a supply interruption would likely be made up by balancing diversions from mainland West Coast, Hawaii and Guam refining centers.

The Trust Territory would qualify for .02 percent or .1 MMB of noncontiguous storage under a proportional location strategy. The increased SPR facility costs would be approximately $.8 million.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in the Pacific Trust Territory are so undesirable, and the benefits of such storage would be so minimal, that it would not be practicable to store a component of the SPR within the Pacific Trust Territory.

Panama Canal Zone

The Canal Zone is a natural transportation node for east-west waterborne traffic. The Canal Zone imports all of its refined products (mainly fuel oil and marine diesel) primarily from Venezuela and the Republic of Panama.

Virtually no supply interruption would be expected in the Canal Zone. However, if shortfalls did occur, they would be replaced with balancing diversions from Caribbean and mainland Gulf Coast refining centers.

The Canal Zone would qualify for about .4 percent or two MMB of noncontiguous storage under a proportional strategy. The added facility costs would be $16.7 million.

FEA finds that the costs and environmental hazards of storing a portion of the SPR in the Canal Zone are so undesirable, and the benefits, if any, of such storage would be so minimal, that it would not be practicable to store a component of the SPR within the Canal Zone.

CHAPTER VI

INDUSTRIAL PETROLEUM RESERVE

CONCLUSIONS

The Energy Policy and Conservation Act (EPCA) provides FEA discretionary authority to order creation of an Industrial Petroleum Reserve (IPR). The FEA has analyzed and assessed the advantages and disadvantages of exercising this discretionary authority, and has determined that there should not be an IPR at this time.

The primary reasons for this decision are:

- o An IPR would not accelerate the development of the SPR;
- o Any regional protection that might be provided by an IPR could be achieved more efficiently and effectively with a Government-owned reserve;
- o An IPR is likely to result in higher costs to the national economy as a whole;
- o An IPR may delay the SPR program, because of legal challenge, and it could create substantial programmatic and environmental problems;
- o An IPR could result in adverse impacts on the competitive environment within the petroleum industry and upon the competitive position of individual firms; and
- o The shifting of costs from the U.S. Government to the petroleum industry (and to consumers of petroleum products) is the only apparent advantage of an IPR, but this does not in itself offer significant economic or conservation benefits.

The analysis showed that an IPR would provide no clear advantages as an efficient means to achieve the development of a Petroleum Reserve. The budgetary benefits of an IPR are outweighed by the resulting higher national cost, by the programmatic, legal and environmental problems that would result

from creating such a reserve, and the potential adverse impact on the competitive environment in the petroleum industry.

FEA will continue to analyze alternative measures to pay for the Reserve, including such options as a tax on petroleum imports. Any recommendations resulting from this continued analysis will be presented to the Congress as an Amendment to the Plan.

When viewed from the national perspective, it is FEA's conclusion that a Federal Government reserve would be more efficient than an industry reserve and that the cost to the Nation would be less if the Government, rather than industry, were to build the reserve. Added costs and inefficiencies of an IPR would stem from the added administrative cost to Government and industry associated with an IPR stored in centralized underground storage facilities. The costs to the U.S. Government (for administration and inspections) and to industry would increase significantly if industry met an IPR obligation by building local dispersed storage. Similarly, the utility of the Reserve would decrease while environmental impacts and inequities among companies might increase with an IPR that utilizes dispersed, company-owned and constructed storage.

As discussed in Chapter III, the planned Federal Government oil acquisition process for the SPR would pass a share of the Reserve costs along to the industry and petroleum users through use of a modified Entitlements Program. These benefits would be gained without the possible inequities and the complex regulatory process that would be required for an Industrial Petroleum Reserve. The impact on consumers also would be substantially less than for an IPR, with about 5-1/2 percent of the SPR budget costs being shifted to industry and consumers, compared with about 35 percent for a full IPR plus any additional costs resulting from the use of more expensive storage facilities.

FEA plans to analyze in more detail the levels and types of petroleum inventories maintained by industry. It is important that the industry does not begin to rely on the SPR as a substitute for industry inventories to meet peak demands, delays in supplies or other operating contingencies. The analysis will consider whether there is a need for a requirement that industry maintain specified levels of inventories.

LEGISLATIVE AUTHORITY AND CONSTRAINTS

Section 156 of EPCA authorizes establishment of an IPR which would be part of the SPR. Under this section, the Administrator of FEA has authority to:

- Require each importer and refiner to acquire, store and maintain a maximum of three percent of his last calendar year's imports or throughput in readily available inventories (based on 1975 refinery throughput and levels of imports, the maximum IPR would be about 185 MMB);

- Require storage in either Government-owned and controlled facilities or other facilities;

- Exempt, fully or partially, firms which are inequitably affected or otherwise incur special hardships; and

- Provide surplus Government storage to reduce inequitable impacts.

Because it would be part of the larger SPR, the petroleum in an IPR would have to be distributed in accordance with the Strategic Petroleum Reserve Plan. However, in certain circumstances, the Administrator of FEA may allow removal or disposal of petroleum products from an IPR without regard to the SPR Plan or to the existence of a state of emergency (section 161(f)).

If FEA were to exercise this IPR authority, the Act places a number of constraints on how it must be done. In addition to the size limit of three percent:

- Industry must own the petroleum stored in the IPR; and

- Pursuant to S 156(c), acquisition, storage, and maintenance of the IPR must be accomplished in a manner which "is appropriate to the maintenance of an economically sound and competitive petroleum industry," and FEA must take steps to avoid "inequitable economic impacts on refiners and importers,"

as well as "special hardship, inequity, or unfair distribution of burdens."

ANALYSIS OF THE ISSUE

In July 1975, the Administrator of FEA informed the U.S. Senate that, if the then pending IPR section was passed, due to the complexity of the issues involved, FEA would carefully analyze the desirability of exercising this discretionary authority. In January 1976, shortly after passage of the EPCA, FEA began to analyze the legal, administrative, economic, and environmental issues that would be involved in the creation and maintenance of an IPR. The purpose of FEA's studies was to assess the benefits and burdens -- for the Nation, the economy, and the SPR as a whole -- associated with implementing this authority. The study efforts were to:

- Assemble and structure the relevant data on the U.S. refining and importing industry;
- Define alternative IPR program characteristics and their respective advantages and disadvantages;
- Analyze the potential impacts of the IPR program on industry and consumers;
- Outline implementation plans for alternative IPR programs; and
- Identify policy issues that must be decided and gaps in the available data that must be filled.

The issues unearthed were complex, and, when the Early Storage Reserve Plan was submitted on April 22, 1976, FEA advised the Congress that "a final decision cannot be made on the advisability of exercising this authority until further information is gathered and analyzed."

FEA's study focused primarily on basic program options, issues, and impacts rather than on detailed systems design and development. In this context, FEA addressed the details of the IPR design only to provide examples of key points and to develop the analytic framework. This approach provided aggregate data from which to develop program cost estimates

and fill schedules under a variety of possible implementation scenarios .

On June 3, 1976, a notice was published in the Federal Register announcing a public hearing to be held on July 19, 1976, and requesting written comments on the feasibility of implementing the IPR program. Written and oral comments were received from 33 organizations and firms. The written comments and oral testimony were reviewed and analyzed by FEA, and the results were considered in the FEA decision-making process.

In addition to its economic analysis and the Inquiry results, FEA carefully analyzed the legal, administrative, programmatic and environmental problems associated with implementing an IPR. Finally, FEA evaluated the General Services Administration's critical materials stockpiling program, and investigated the experience of France and Germany with industrial oil stockpiling programs. These efforts yielded little of precedential value in the context of an IPR.

RESULTS OF THE ANALYSIS

Impact on Speed and Efficiency of Developing an IPR

An IPR would be attractive if industry could provide for the development of a Reserve substantially faster than could a Government storage program. The analysis concluded that this is not feasible. There is very little storage capacity readily available to industry that could be used for an IPR. Most of the available capacity is already being used for industry inventories, and surveys of storage tankage indicate that only a few million barrels of capacity would be readily available. It would not reduce the vulnerability of the U.S. to a future petroleum supply interruption to have industry reduce its normal inventories in order to establish an IPR.

If industry were to implement an IPR that resulted in a real increase in U.S. petroleum supplies, it would require the construction of most of the required capacity. This might be done directly by industry, or industry could choose to use Government-constructed storage. In either case, a meaningful amount of additional storage capacity for an IPR would not be available sooner than it will be available with a Government-constructed and funded storage program.

An IPR also might be attractive if industry could develop the storage facilities or acquire the oil more efficiently than under a direct Government program. There is no evidence that this would be feasible. On the contrary, the analysis indicates that an IPR would likely be more costly. Even if industry used Government-constructed storage facilities, there would be no cost savings to the Nation with an IPR. Indeed, costs to the Nation would be slightly higher due to the regulatory staff and administrative costs to both the industry and the Government to manage an IPR.

If industry constructed its own storage facilities, the costs could be significantly greater than Government storage, depending on the manner of implementation. For example, if industry used steel tanks, the storage cost per barrel could be $5 to $10 higher than Government storage in salt domes or mines. Much of such higher costs would be passed along to petroleum consumers in higher prices for products. Even if industry chose to put much of an IPR in privately-owned underground storage, the costs would be equivalent to or perhaps higher than Government storage costs because of savings due to the economies of scale that can be obtained by the Government in storing the Reserve at only a few sites.

In summary, an IPR does not offer any advantages in terms of either speed of development or economic efficiency.

Providing Regional Storage

Interest has been expressed in using an IPR as a means of dispersing some of the Reserve storage in various regions of the country. FEA has concluded that an IPR applied to all refiners and importers would be a costly and unnecessary means of meeting regional needs.

If an IPR were required, it is likely that some firms would build steel tanks near or in the area of consumption. As discussed previously, this would be very costly compared with underground salt caverns and would present environmental hazards. On the other hand, some firms might choose to use lower cost underground salt cavern storage, developed either by the Government or by private industry. Such storage would be located where salt caverns are available and accessible to

ports or pipelines, rather than being dispersed in the using areas.

It would not be desirable to require all refiners and importers to store an IPR in the areas of consumption. This would substantially reduce the usefulness of the total SPR by placing a significant portion of the Reserve in areas that are unlikely to be impacted by an oil import interruption and where the Reserve oil could not be readily moved to other areas of the country. This approach would also force the use of high cost storage facilities for much of the IPR, thereby further increasing costs to petroleum consumers.

As discussed in Chapter V, there is not now a need to store any of the SPR in any specific region or area of the country. If changes in the future should require such storage, it is likely to be most efficient to use Government storage facilities in order to obtain economies of scale, minimize environmental hazards, and assure that the storage is accessible to meet the regional needs on a timely basis.

Administrative and Legal Problems of an IPR

From the outset, FEA has been keenly aware that any exercise of the discretionary IPR authority is subject to the conditions set forth in section 156(c). In determining whether to exercise this authority, it is clear that a number of important administrative, legal and programmatic problems must be overcome to implement an IPR.

Even though importers and refiners would own the oil in IPR storage, if FEA were to exercise a sufficient degree of control over this oil it might be adjudged by the courts to have unconstitutionally "taken" industry's oil temporarily without just compensation. At issue is the degree of control that FEA could exercise without being found to have "taken" this oil. Pending resolution of this issue, FEA would have to minimize its control by offering industry the option of storing oil in its own facilities as opposed to centralized storage. If individual firms chose to exercise this option it would lead to dispersed storage which would be more costly and may have greater environmental impacts. At the same time the inspection and administration of decentralized storage would place greater cost burdens on FEA and industry. But

even offering industry this option would not suffice to fully eliminate the legal challenge.

Another serious issue is whether a firm can be required to store a slate different from its imports or throughput. Requiring each firm to contribute a percentage of the volume of each type of oil and product imported or refined during the previous calendar year may pose serious problems:

- The IPR would contain a wide variety of crudes and products, many of which would be of little value during an interruption;
- Storage costs would be increased due to the need to store different products separately and periodically to "turnover" certain refined products, and central storage would be less feasible;
- Questions of equal treatment would arise because some firms would be required to store products or high value crudes while others would not; and
- Changing mixes of products and crude runs are normal, and would complicate administering an IPR.

The program would be difficult to implement in a uniform fashion. Some firms would be exempted or granted relief for economic reasons. Many would argue strongly that they should be exempted. These cases would have to be resolved on their individual merits. To implement such a program in a complex, diversified, continually changing industry while ensuring no "unfair distribution of burdens" and maintenance of a sound competitive structure, would be a difficult and expensive administrative requirement. Special exceptions and exemptions from an IPR requirement would affect company investment requirements and market needs, and may lead to claims of competitive advantages for those receiving the relief, and to assertions of disadvantages for those who do not.

Based on responses to FEA's Inquiry, it appears that a number of legal issues will be raised by industry and that these may be litigated over several years. While the Government might not lose any cases, the process will consume resources and could delay buildup of the SPR to the full 500 MMB level.

Potential Industry Impacts and Other Economic Disadvantages of an IPR

Under the EPCA, refiners and importers could be required to pay the cost of acquiring, storing and maintaining as much as 185 million barrels of oil. The capital investment in crude oil for a 185 MMB IPR would be about $2.4 billion in 1976 dollars (see Table VI-1). This would be an average capital outlay of about $0.07 per year per barrel used in the U.S. over the five years when most of the investment would be made. The new capital outlays in all refineries in the Nation in 1974 was $1.775 billion, or $0.37 per barrel refined according to figures published by the Chase Manhattan Bank.

FEA anticipates that other inequities and adverse effects on the competitive nature of the industry may develop if an IPR is implemented because:

- Large firms, with greater access to sources of crude and capital, wider product mixes, and wider geographical marketing areas, have more flexibility in passing through costs than small firms.

- Differences do exist in the abilities of even the largest integrated firms effectively to pass through costs, due in large part to the degree of their dependence on imported crude and products.

- Small firms have by nature a more limited ability to effect a cost passthrough, but small firms, because of their vulnerability, have historically been granted special treatment under many programs, e.g., the Entitlements, Oil Import and Crude Oil Buy-Sell Programs. This special treatment has at times resulted in unfair competitive advantages for some small refiners, to such a degree that modifications in this treatment were required. Implementation of an IPR would have to take these problems into account.

The likely result of an IPR is that unequal abilities of individual firms to absorb and/or passthrough the costs associated with an IPR could lead to some further competitive

Table VI-1

ESTIMATED COST OF AN IPR

Year	Oil Added to IPR MMB	Cumulative IPR Stock MMB	Cost of Oil ($ millions) Annual	Cumulative	Annual Cost ($ millions) Cost of Capital A(10% p.a.)	Cost of Capital B(13% p.a.)	Fac. Rental[1] &Maintenance	Total Annual Cost[2] ($ millions) A	B	Total Annual Cost per BBL Stored (dollars) A	B
1977	8.9	8.9	96.2	96.2	1.6	2.1	.4	2.0	2.5	1.38	1.70
1978	47.4	56.2	516.7	612.9	35.5	46.1	9.8	45.2	55.9	1.39	1.72
1979	44.4	100.6	529.7	1,142.6	87.8	114.1	23.5	111.3	137.6	1.42	1.75
1980	19.6	120.3	274.7	1,417.3	128.0	166.4	33.1	161.1	199.5	1.46	1.81
1981	33.3	153.6	471.5	1,888.8	165.3	214.9	41.1	206.4	256.0	1.51	1.87
1982	31.4	185.0	449.4	2,338.3	211.4	274.8	50.8	262.2	325.6	1.55	1.92
1983		185.0		2,338.3	233.8	304.0	55.5	289.3	359.5	1.56	1.94
1984		185.0		2,338.3	233.8	304.0	55.5	289.3	359.5	1.56	1.94
1985		185.0		2,338.3	233.8	304.0	55.5	289.3	359.5	1.56	1.94

1. Annual cost for maintenance and operation at $.04 per barrel per year plus amortization of government salt domes at $.26 per barrel per year. Amortization is based on average initial investment of $1.52 per barrel per year at 10% government cost of money over 8 years.

2. Series A based on 10% of capital which approximates commercial borrowing rates; Series B based on 13% cost of capital which approximates the average rate of return expected for oil company investment.

NET DISCOUNTED COSTS AND ANNUAL COSTS PER BARREL OF CONSUMPTION

	A (Millions of Dollars)	B (Million of Dollars)
Total of Annual Costs (Present Value)	779.18	966.76
Total of Oil Expenditures (Present Value)	1497.14	1497.14
Value of Oil in 1985 (Present Value) (185 mmbbl x$14.70/bbl discounted at 13% to 1976)	905.28	905.28
Net Cost (Present Value)	1371.04	1588.62
Annualized Cost for 9 Years	261.6	303.16
Annual Cost/BBL Consumed (17 mmbd consumption)*	.042	.049

* 10% cost of Capital (Column A) used in text

distortion in the marketplace, and to competitive disadvantage for some firms.

The existence of an IPR would also have an impact on the industry structure due to the lower profit margins of some operations. Table VI-2 shows the ratio of the cost of an IPR to each company's published earnings in 1975. The implications are that some less profitable or more specialized companies might be required to invest more new capital than their earnings to meet their obligations under an IPR. The table shows the wide range of impacts that an IPR might have.

There will be moderate economic impacts to industry as a whole if industry has to finance the $2.4 billion capital cost over the six years, as well as pay the annualized cost of $0.042 per barrel for the life of the program.

Funds could be diverted from other investments, including energy producing ventures. Marginal or specialized firms may fail to obtain financing and may close or be absorbed. If only some firms are unable to pass costs through, they may be at a competitive disadvantage with those who can pass through costs on different products in other areas or at different times.

Impact on the Federal Budget

The potential budget savings between 1977 and 1985 to the U.S. Government if a full IPR were implemented are estimated to be approximately $2.4 billion (in 1976 dollars) for purchase of oil, $281 million for constructing underground storage facilities, and $1.4 billion to operate and maintain facilities and pay carrying charges on capital invested in oil and facilities. An added cost of about $4.1 million would be required to administer an underground IPR program during this period. Thus, the net effect of the IPR program would be to shift approximately $4 billion from the Federal budget to the private sector during this period. (Of this amount, $2.4 billion is directly associated with purchase of oil and may be recouped by industry when the program is terminated, assuming no change in the real price of oil.)

An IPR does represent an opportunity to shift costs within the economy, to reduce Federal spending, and place some of the SPR costs on those sectors of the economy most likely to directly benefit from a Reserve. The cost to the Nation as a whole will be greater. The 185 million barrels will be purchased in any case, and there is no reason to believe industry would have a cost advantage. Therefore, the net impact

ANNUALIZED TOTAL COST (in 1976 dollars) FOR PERIOD 1977-1985
TO ACQUIRE AND STORE 3% IPR IN ACCORDANCE WITH 37% OF SPR FILL SCHEDULE

Refiners	Oil Imported or Refined (000B)	Annualized Cost[1] at .042 per bbl Throughput $ Millions	Earnings $ Millions	Cost/Earnings
EXXON	500.530	21.02	2,503.00	.0084
Amerada Hess	355.070	14.91	128.00	.1165
Sun Oil	134.604	5.65	220.00	.0256
Ashland Oil	126.444	5.31	119.00	.0446
Marathon Oil	109.217	4.59	128.00	.0358
Clark Oil	38.282	1.61	5.24	.3068
Tesoro Petroleum	22.879	.96	42.90	.0224
Apco	18.500	.78	2.08	.3736
Quaker State	7.487	.31	23.20	.0136
Marketers-Importers				
Northeast	54.052	2.27	6.47	.3509
Cleveland Cliffs	.505	.02	31.00	.0007

1 Based on a present value (1976) total cost of $1.371 billion annualized over 9 years at 10% and annual throughput of 6.205 billion barrels petroleum.

on consumers will be greater due to higher administrative and facility costs.

FEA believes that reduction of Federal budget outlays, while desirable, should not be the overriding consideration. Although an IPR could save as much as $4 billion in budget outlays over the next eight years, it is questionable whether such savings would significantly contribute to the usual objectives sought from reducing such outlays. The two key reasons normally cited for restraining the Federal budget are to:

- Minimize the role of Government and maximize individual freedom; reduced Government spending will leave more resources for individual decisions.

- Carry out responsible economic policies by not stimulating the economy, through Government spending, beyond its capacity to respond; excessive spending will lead to future inflation and unemployment.

Implementation of an IPR would reduce Federal spending by requiring users to pay a portion of the cost of the SPR. While this partially accomplishes the first objective of leaving discretion to individuals (by not charging the taxpayers for these costs), it is not fully consistent with that objective because the Government would be requiring the private sector to take certain actions and to bear the costs. An IPR would itself represent another intrusion of Government into private affairs. Indeed, the tendency for regulatory efforts unnecessarily to intrude in private affairs could result in even greater Government interference and less private discretion under an IPR than under a direct Federal program'

Implementation of an IPR may do little or nothing to achieve the second objective, that of responsible economic policy. Although an IPR would reduce on-budget spending, the Government would still require the private sector to spend the money to build the Reserve.

It is unlikely that an IPR would do much to help attain either of the two usual budget objectives, and there does not appear to be a valid reason to implement the IPR simply to hold down Federal spending.

Impact on Energy Conservation and on Consumers

Energy conservation is a possible IPR benefit which must be considered. To the extent that the costs of a petroleum storage program are passed on to consumers, the increase in the price of petroleum products can be expected to reduce demand for them. Demand elasticity, which defines the percentage change in the amount demanded as a result of a one percent change in the price, is a concept that economists use to relate changes in the amount demanded to changes in price. In the short run, consumers are constrained from modifying their consumption patterns and demand is relatively insensitive to price. In the long run, the effects of fuel substitution and technological change are felt and the same price rise will have a relatively larger effect on demand. FEA's current estimate of long run demand elasticity resulting from petroleum price increases is .18.

Based on this elasticity, if industry passes on to consumers all costs associated with financing, operating, and maintaining an IPR, an estimated decrease in demand of 3.2 million barrels per year in 1983 would result. This would reduce the cost of imports by about $65 million. However, the 3.2 million barrels per year reduction in petroleum consumption may be compared with an annual petroleum consumption in the U.S. of approximately 6.2 billion barrels (petroleum in turn accounts for 46 percent of total U.S. energy consumption). The potential IPR-related demand reduction is not significant in comparison to overall conservation goals.

If all of the cost of an IPR were passed along to consumers, the added cost per gallon of petroleum product would be between one-tenth and two-tenths of a cent. This cost would be added not for just one or two years as in the case of the proposed oil acquisition process, but for the full life of the program.

The effects on different groups of consumers are predictable. Consumer Expenditure Surveys by the Bureau of Labor Statistics show that high income groups spend significantly more on petroleum products than do low income groups. But low income groups spend a much greater percentage of their total income on petroleum products than do high income groups. For example, based on the 1973 Survey, those with incomes below $4,400 spent 9.5 percent of their income on gasoline and fuel

oil, while those with incomes over $19,500 spent 3.3 percent.

INDUSTRY INVENTORIES AND THE SPR

All segments of the petroleum industry maintain inventories to ensure the economical and efficient operation of their business. Historically, these stocks have tended to increase as demand has increased and to exhibit significant seasonal variation as stocks are built up in anticipation of heavy demands. This is particularly true of the inventory increases in heating oil before winter and of gasoline before summer.

These inventories, which are stocked to ensure efficient business operations, are important for the planning of the SPR. These stocks, even when they are at their lowest (such as the inventory of heating oils near the end of winter), together with crude oil and refined products in transit, provide the cushion needed to ensure that there is sufficient time to implement the drawdown of the SPR in the event of an oil interruption so that no area of the country will be without petroleum products.

FEA plans to make a thorough study of industry inventories at all levels to obtain more complete information on the extent to which inventories could be used during a supply interruption. It is important that industry not alter its normal business practices and place undue reliance on a Government-owned Reserve. The analysis will consider whether there is a need to establish any requirements that industry maintain specified levels of inventories.

CHAPTER VII

DISTRIBUTION PLAN

CONCLUSIONS

The SPR Distribution Plan is being developed as an integral part of a larger, more comprehensive plan to prepare for national energy emergencies as well as to provide the means to fulfill obligations of the United States under the International Energy Program. This is to ensure that plans for the drawdown and distribution of the Reserve will be consistent with national goals and objectives, and with other programs which would be implemented in a crisis management environment.

A detailed Distribution Plan has not yet been developed. It will not be possible to complete the development of such a plan until final decisions have been made on important elements of the program such as the specific storage site locations and the types of crude to be stored at each site. It also will require completion of a petroleum allocation system to reflect the availability of the Reserve oil, as well as completion of other contingency plans such as emergency energy conservation measures. This chapter identifies and discusses the major objectives, criteria and other factors that will be considered in developing the detailed plan during the next several months. The implementing decisions for all contingency programs, including SPR drawdown, will be influenced by a variety of conditions such as the nature of the interruption, the state of the economy, and the stage of SPR development. Within this framework, six key elements have been identified for the drawdown and distribution of SPR oil.

Trigger Mechanism

The decision on whether and how to use the Reserve will be made by the President in the event of an interruption. Contingency plans will be developed for a variety of interruption conditions, and a recommendation on the Reserve's use will be made by FEA to the President within ten days of an apparent need for the Reserve. It is considered infeasible and undesirable to specify any precise conditions for using the Reserve because: (1) there are innumerable factors that

might affect such decisions; and (2) the objective of the Reserve to deter a politically motivated embargo is furthered by ensuring that potential embargoing producers are uncertain of our intentions concerning when and how the Reserve would be used.

Drawdown Rate

Two of the major considerations on which decisions for specific drawdown rates will depend are: (1) the supply shortfall caused by an interruption; and (2) its duration. One of the contingency options will be to use the SPR oil up to the maximum drawdown rate in order to minimize the initial economic impact caused by an interruption. In subsequent stages of an interruption, the drawdown rate will be adjusted in coordination with the other contingency programs, including energy conservation efforts, in effect at the time.

Pricing

Ultimate charges for SPR oil are expected to be based on several factors, including the nature of an interruption, the amount of oil remaining in storage, energy conservation objectives, provision for replacing the Reserve oil, and to minimize adverse impacts on the economy. A number of pricing strategies will be available to meet these objectives under varying interruption conditions.

Allocation and Regulatory Controls

Consistent with the objectives of the Emergency Petroleum Allocation Act and the Energy and Policy Conservation Act, allocation and other necessary regulatory procedures will be developed to assure that all available crude oil is equitably distributed, and that priority product demands are satisfied. FEA has a responsibility to assure the availability of refinery products for the import-dependent regions of the country. This requires action by FEA to ensure the equitable allocation of products during an interruption such that no region bears more that its fair share of the economic impact of the interruption.

Transportation

Actual transportation arrangements for movement of SPR oil will be the responsibility of the private sector. The availability of SPR oil will be made known through the allocation system, and industry will then make the pipeline and shipping arrangements to move the oil to where it is needed. The responsibility of FEA will be to ensure accessibility to port and pipeline facilities in the area of the storage sites to draw down the Reserve at its maximum rate, and to remove any obstacles that might adversely affect industry's ability to transport the oil. This might include, for example, a waiver of the Jones Act requirement to permit use of foreign flag tankers if adequate U.S. flag tankers are not available.

Management and Operations

The operating plans will provide for activities such as monitoring, security, drawdown scheduling, financial audit, and handling of fees, to ensure rapid response capability and proper functioning during drawdown and distribution.

BACKGROUND AND OBJECTIVES

Section 154(e)(12) of the Energy Policy and Conservation Act (EPCA) requires that the Strategic Petroleum Reserve Plan shall include "a Distribution Plan setting forth the method of drawdown and distribution of the Reserve." In the final analysis, the measure of the Reserve's effectiveness will be its ability to lessen the adverse economic, social, or political impacts on the Nation that might result from an interruption of petroleum supplies. Therefore, the Distribution Plan will focus on the objectives of reducing our vulnerability to the threat of interruption and the impact from any such interruptions.

Section 161(d) of the EPCA stipulates that drawdown and distribution of the SPR may not be made unless the President finds such actions are required due to "a severe energy supply interruption or by obligations of the United States under the international energy program." A severe energy supply interruption is defined in the EPCA under section 3(8) as "a

national energy supply shortage which the President determines:

- o Is, or is likely to be, of significant scope and duration, and of an emergency nature;
- o May cause major adverse impact on national safety or the national economy; and
- o Results, or is likely to result, from an interruption in the supply of imported petroleum products, or from sabotage or an act of God."

The International Energy Program to which section 161(d) refers means the Agreement on an International Energy Program, signed by the United States on November 18, 1974, including all annexes and amendments to such Agreement. The major provision of this program is to share an emergency allocation program among 19 participating countries under conditions specified in the Agreement.

Sections 161(e) and (f) of the EPCA provide additional guidance regarding implementation of the Reserve, stating that:

- o The Administrator may, by rule, specify price levels and allocation procedures;
- o Such price levels and allocation procedures shall be consistent with the attainment, to the maximum extent practicable, of the objectives specified in section 4(b)(1) of the Emergency Petroleum Allocation Act (EPAA) of 1973 ; and
- o Removal and disposition of products from the Industrial Petroleum Reserve (IPR) shall be according to such terms and conditions as the Administrator may prescribe. (This provision will become operable only if an IPR is employed.)

The objectives specified in section 4(b)(1) of the EPAA are as follows:

"(A) protection of public health (including the production of pharmaceuticals), safety and welfare (including maintenance of residential heating, such

as individual homes, apartments, and similar occupied dwelling units), and the national defense;

(B) maintenance of all public services (including facilities and services provided by municipally, cooperatively, or investor owned utilities or by any State or local government of authority, and including transportation facilities and services which serve the public at large);

(C) maintenance of agricultural operations, including farming, ranching, dairy, and fishing activities, and services directly related thereto;

(D) preservation of an economically sound and competitive petroleum industry; including the priority needs to restore and foster competition in the producing, refining, distribution, marketing, and petrochemical sectors of such industry, and to preserve the competitive viability of independent refiners, small refiners, nonbranded independent marketers, and branded independent marketers;

(E) the allocation of suitable types, grades, and quality of crude oil to refineries in the United States to permit such refineries to operate at full capacity;

(F) equitable distribution of crude oil, residual fuel oil, and refined petroleum products at equitable prices among all regions and areas of the United States and sectors of the petroleum industry, including independent refiners, small refiners, nonbranded independent marketers, branded independent marketers, and among all users;

(G) allocation of residual fuel oil and refined petroleum products in such amounts and in such manner as may be necessary for the maintenance of, exploration for, and production or extraction of --

(i) fuels, and

(ii) minerals essential to the requirements of the United States, and for required transportation related thereto;

(H) economic efficiency; and

(I) minimization of economic distortion, inflexibility, and unnecessary interference with market mechanisms."

Stated in broad terms are the following additional objectives to which the Distribution Plan will strive. These include:

- Development of an informational, organizational, and managerial framework which will permit a positive,

timely, and efficient response when the Reserve is needed;

- o Capability to respond to a variety of supply interruptions; and

- o Administratively, to function in harmony with other contingency plans and related programs, and industry and consumer needs.

Accomplishment of these objectives requires a dynamic Distribution Plan dependent on continuing updated analysis of information regarding the petroleum market and economic conditions, as well as a network of crisis management plans and programs. The SPR is only one element of the overall crisis management plan to be delineated by the Federal Energy Administration as called for by the EPCA. The broader plan involves several programs which address four basic goals. These goals are shown with their supporting programs below.

- o Increase available supplies --
  - Mandate maximum efficient production rate;
  - Increase imports from available sources;
  - Draw down industrial inventories;
  - Draw down the Strategic Petroleum Reserve;
  - Convert to coal as energy source; and
  - Mandate temporary emergency production rates.

- o Restrain demand --
  - Increase public awareness of emergency;
  - Implement voluntary conservation plans; and
  - Implement mandatory conservation plans.

- o Equitably distribute supplies --
  - Implement mandatory petroleum allocation program;
  - Adjust refinery yield;
  - Provide State set-asides; and
  - Impose coupon rationing.

- o Avoid inequities --
  - Impose price controls and entitlements, if appropriate.

Although these programs address different aspects of managing a petroleum shortfall, all are designed to minimize the adverse economic and social effects that result from a supply interruption. Therefore, it is imperative that each action

complement the others and be well-integrated in the overall crisis management plan.

Implementation of the SPR will be guided by all four goals, but its primary role will be to provide an additional source of supply during an interruption. At the maximum drawdown rate of 3.3 million barrels a day, for which the Reserve is designed, the SPR could meet 20 percent or greater of projected daily crude input requirements to refineries, or equal 30 to 50 percent of normal imports as projected in Chapter II. The duration of supply will depend on the size of the Reserve at the time of an interruption and the drawdown rate.

As a major component of the overall plan, the relationship of the SPR to the other classes of programs must be well defined since the effectiveness of the other contingency actions will have a bearing on decisions regarding employment of the Reserve.

FLEXIBILITY OF RESPONSE

To effectively employ the Reserve during a supply interruption, the decision criteria and supporting elements of the Distribution Plan must be structured in a way which allows the Reserve to play a wide variety of roles within the total response strategy. The response strategy to even a single interruption will likely change over the course of an interruption as different and competing national objectives are viewed in light of changing external conditions surrounding the supply curtailment. The dynamic nature of the overall strategy will in turn determine the specific role and implementation of the Reserve.

In addition to the nine national goals established by the EPAA, and outlined in this chapter, there are three other objectives which merit attention during a supply interruption. These include:

- Preventing panic buying and product hoarding;
- Establishing a proper national climate for combatting the supply interruption; and
- Securing a strong negotiating position in the event

that the supply interruption is an economic or political embargo against the United States.

Reserve implementation decisions will be structured to address these objectives.

Decision Criteria

There are a number of conditions which will establish the parameters of an interruption and will shape the response to that interruption. Several of the considerations which will be included in the decision criteria follows:

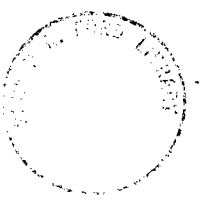
State of the Economy -- Use of the Reserve will be coordinated with other elements of national economic policy.

Nature of a Supply Interruption -- This includes the cause of an interruption, the quantities of the supply shortfall it produces, the types of product lost, the expected duration, the time available in which to respond, and the regional impact.

Conservation Potential -- Voluntary demand restraint and mandatory conservation programs developed pursuant to the EPCA, will be counted on to offset a supply reduction.

Availability of the Reserve -- Depending on operational constraints and the state of fill, the Reserve would be able to offer a range of responses. These parameters will be particularly crucial during the early stages of Reserve development.

The overall crisis management strategy depends on the impact of these external conditions on the specified national objectives. Selection of a general strategy will be the responsibility of the President. Translating that selection into efficient and effective procedures will require coordination of many elements of the Government and the close cooperation of industry.



Implementation Strategy

For implementation purposes, the management framework consists of three activities: (1) data gathering and analysis; (2) operations during use of the Reserve; and (3) administrative responsibilities. Both the data gathering and administrative responsibilities will be continuing activities, preceding and following use of the Reserve, but expanded during its use.

Data Gathering and Analysis -- A monitoring and information system is to be implemented which will be useful for a number of contingency programs in addition to the Reserve. The system must be established well in advance of a supply interruption in order that petroleum supply and demand patterns under normal conditions can be established. This benchmark analysis is critical if the Reserve and other contingency programs are to attain their goal of a business-as-usual environment during their implementation. The system will rely to the maximum extent practicable on data which is readily available from both Government and non-Government sources. However, during a supply interruption it may become necessary to require additional or more frequent reporting, particularly from the shipping and petroleum industries. Results of the analysis will be fed back to those industries to assist in their adjustment decisions.

Reserve Implementation -- Specific elements associated with Reserve implementation are discussed later in this chapter. In addition to implementing actions taken by FEA, the petroleum industry is expected to take complementary independent actions. Among others, refiners and importers will be encouraged to seek out alternative import sources, participate in trades to obtain the crude mix needed to meet product yield requirements, adjust production to maximum efficient rates, and notify distributors of changes in product output. The interface of these activities with those by the Government will be established primarily through the data gathering activity described above.

Administrative Responsibilities -- The major categories in this area include notification, regulation, and enforcement. Notification will be provided of a pending or actual supply interruption, emergency reporting procedures, conservation measures to be effected, and regulatory measures implemented. Several areas where regu-

lations may be used include: allocation of crude, price controls, refinery yield controls, inventory management, and conservation measures. While these regulations will have greater scope than just for the Reserve, the drawdown and distribution of the Reserve will be consistent with all such regulations. Further, it is planned that all Reserve regulations will be accompanied by appropriate enforcement procedures similar to those for the other regulations. Based on the severity and duration of an interruption, actions affecting use of the SPR will be periodically adjusted to meet new conditions.

IMPLEMENTATION ELEMENTS

Six key elements related to actual drawdown and distribution of the Reserve are as follows:

- o Trigger Mechanism
- o Drawdown Rate
- o Pricing
- o Allocation and Regulatory Control
- o Transportation System
- o Management and Operational System

Trigger Mechanism

Only the President may initiate drawdown of the Reserve, and then only in the event of a severe supply interruption or to satisfy an obligation of the United States under the International Energy Program (IEP). In either case, indications of a potential need for the Reserve could be received from a number of sources including diplomatic warnings, an information monitoring system, etc. Within ten days after an unexpected disruption is announced or becomes apparent, FEA will make a recommendation to the President concerning use of the Reserve.

While this plan calls for a recommendation to be made to the President within ten days of a real or apparent need for the Reserve, in view of the dynamic and sensitive nature expected to be associated with a supply interruption or an IEP obligation it would be imprudent to select any absolute levels as triggers for activating the Reserve. This should not be mis-

interpreted as a lack of willingness to use the Reserve. There are no significant advantages to be gained in trying to determine in advance even the most obvious situations where the Reserve would be used since there is every reason to believe the Reserve will be used in every situation where it is truly needed, without absolute triggers.

The decision criteria which would be considered prior to activating the Reserve include the state of the economy, the nature of the interruption, the status of other contingency programs such as energy conservation, and the capability of the Reserve. These and other criteria will be examined in combination with the most likely supply interruption scenarios to develop a decision-making process which would facilitate rapid activation of the Reserve.

Conversely, the EPCA precludes use of the Reserve for arbitrary or non-essential purposes such as reducing the storage level of industrial petroleum inventories required to meet varying peak or seasonal demands. Even during a minor interruption, the supply shortfall might be accommodated through demand restraint or other contingency programs.

Drawdown Rate

The strategy concerning drawdown rates is a critical element of the Distribution Plan inasmuch as the rate of drawdown will directly affect other elements of the Reserve such as allocation and distribution as well as the length of time that oil is available from the Reserve. Many of the same factors influencing the decision to use the Reserve will also affect formulation of the drawdown strategy. Also, due to likely uncertainties regarding duration of an interruption, analysis and interpretation of these factors will be needed in order to alter the drawdown rates and to discontinue use of the Reserve in much the same way as was needed for its activation.

Two of the major considerations on which decisions for specific drawdown rates will be based are: (1) supply shortfall caused by an interruption; and (2) its duration. All drawdown strategies considered for the Reserve are expected to be based on the principles that:

- Oil from the Reserve will be used in coordination with other programs at a rate that minimizes the

economic impact during the initial stages of an interruption.

- o After fulfilling its role as a cushion to the initial impact of the interruption, the Reserve drawdown rate may be decreased in order to balance employment and production losses in the short-term against extended need for the Reserve.

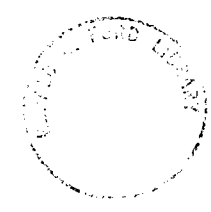
Minimizing shortfall in the initial stages of an interruption would permit time to establish and implement emergency allocation, price control, conservation, and other contingency programs. This strategy would help prevent panic buying of spot oil at highly inflated prices on the world market, reduce upward pressure of post-interruption prices, minimize hoarding of products on the wholesale-retail-consumer levels, and control or at least delay GNP loss. It also would allow time to adequately prepare and inform the public of the ensuing petroleum shortage. After the initial adjustment period, maintaining a constant or slightly declining level of drawdown over an interruption would permit the allocation and conservation programs to function in an approximately steady-state environment. This would contribute to the stability necessary for proper planning and coordination of efforts.

While these principles will be considered in developing a drawdown recommendation, sufficient latitude must be retained to ensure that the President will have wide discretion in determining specific drawdown rates during the course of an interruption.

Pricing

Prices charged for Reserve oil should not be established until a decision is made to implement the Reserve.

A number of pricing strategies are being considered, each of which might have considerable merit in a given situation. Whatever price is charged, it must be completely in accord with other strategies pursued by the Reserve drawdown and other contingency programs. For example, it may be desirable to reduce the drawdown rate after some initial period of SPR use as discussed in the "drawdown" section above. To promote this strategy, it may be desirable to charge progressively



higher prices for SPR oil based on the amount of Reserve remaining.

Factors which will likely affect prices to be charged include:

Nature of an Interruption

A sudden unplanned (e.g., natural disaster) interruption would likely result in a pricing policy that stressed either the world open market price or the replacement cost, whichever was more appropriate at the time. A political or economic embargo might require a different pricing strategy, more tailored to achieving U.S. economic and political goals.

Amount of Petroleum in Storage

Consistent with expected pressure to conserve the SPR as it is depleted, a progressive pricing strategy may be adopted in which prices for SPR oil would increase as the Reserve is drawn down. This strategy would have side benefits such as forcing industry and the public to seek alternative sources and promote conservation. As with the other objectives which might provide a reasonable basis for pricing, this consideration must be balanced against competing objectives at the time an interruption occurs.

Encourage Conservation

While one objective of the Reserve is to avoid a sudden increase in petroleum prices and the concurrent adverse economic impacts that this would cause, the price of the SPR should be high enough to promote the conservation of this resource. The prices must also be carefully balanced and integrated with other conservation measures which might be implemented.

Final implementing decisions must weigh competing, and potentially conflicting, objectives at the time of the crisis, as restraining demand is only one objective.

Provide Replacement Funds

This objective is directed at setting prices sufficient to replenish the Reserve after an interruption has required its use, and is desirable in several respects. First, it forces consideration of future petroleum market conditions -- domestic and abroad. It would also help to promote conservation of the Reserve if, as is likely, oil prices are forecast to be higher subsequent to an interruption. This strategy would place most of the financial burden associated with reestablishing the Reserve on the users of the Reserve. However, as with the conservation objective, this method is largely indifferent to economic impact and should not be considered in isolation from other factors.

Minimize Adverse Impacts on the Economy

This objective could potentially conflict with the previous two considerations for price-setting and will depend to a great extent on the state of the economy when an interruption occurs. Also, just as the Reserve has been designed to optimize its benefits for the Nation as a whole, so the pricing strategy will place more emphasis on the overall national economy than regional or individual concerns. In this regard, there is a genuine concern for the equitable distribution of the economic impact from an interruption; however, pricing of SPR oil per se cannot provide this equity. That objective will more appropriately be pursued through regulatory procedures designed for that purpose, as discussed below.

Of course any pricing decision must take into account the interrelationships between Reserve drawdown and whatever system of petroleum price controls may exist at the time of distribution.

Allocation and Regulatory Control

Section 161(e) of the EPCA states that allocation procedures for the SPR "shall be consistent with the attainment, to the maximum extent practicable, of the objectives specified in

section 4(b)(1) of the Emergency Petroleum Allocation Act of 1973." Those objectives are listed earlier in this chapter.

To ensure maximum satisfaction of these objectives, the SPR Distribution Plan must be synchronized with the Mandatory Petroleum Allocation Program, created under section 4 of the Emergency Petroleum Allocation Act (EPAA) of 1973.

The current allocation program consists of two parts:

- o A system for distributing petroleum products; and
- o A system for allocating crude supplies.

In its current form, the crude oil allocation program has the following features:

- o Supplier-purchaser relationships in domestic crude oil sales are "frozen" to ensure maintenance of historical distribution patterns and to protect the crude supply sources of the small refiners; and
- o A Buy-Sell Program requires the sale of crude oil by large integrated refiners to small and independent refiners on the basis of historical crude oil inputs and refining capacities.

Both features are designed to permit competitive refining operations by refiners who control little or no domestic crude oil supplies.

Another aspect of this allocation system is a refinery yield program to establish incentives to produce the most needed refinery products. Although the relationship of crude oil and refinery product allocation to a refinery yield program has not been fully defined, refinery yield controls may be necessary to enhance the ability of the allocation system to meet high priority product demands and reduce net shortfalls caused by lost product imports.

Should an incentive method fail to produce the desired refinery yields, mandatory requirements could be applied. Section 457 of the EPCA amended the EPAA by adding section 14, which authorizes the President to "require adjustments in the operations of any refinery in the United States with respect to the proportions of residual fuel oil or any refined petroleum product produced through such operations if he determines such adjustments are necessary to assure the production of residual fuel oil or any refined petroleum product in such proportions as are necessary or appropriate to provide for

the attainment, to the maximum extent practicable, of the objectives specified in section 4(b)(1)."

At this time, specific provisions have not been developed for integrating the SPR into the allocation regulations. Study of this problem has begun and a number of alternatives have been considered.

The approach will be to develop allocation and regulatory controls within the total crisis management framework. This approach should ensure that the regulations and procedures developed are consistent with the EPAA, ensure consistency with other contingency plans authorized by the EPCA, ensure that proper economic considerations are given to developing the allocation and regulatory procedures, and, most importantly, ensure the equitable distribution of oil from the Reserve.

Some form of price controls on crude oil may be applied in the event of a severe supply interruption, to control price increases by domestic oil producers. Price control authority for the SPR exists in the EPCA and extends to June 30, 1985.

Crude oil price controls are, however, only one of three mechanisms for blunting price impacts during an interruption. Two other programs complementing this system are: (1) the entitlements program used to equalize the cost of crude among refiners and eliminate the competitive advantage of refiners with access to lower priced domestic crude; and (2) an extensive system of available price controls on refined products, which regulates the pricing practices of refiners, wholesalers, and retailers.

Any pricing policy chosen for SPR crude will be consistent with this price control framework, which permits considerable latitude in the design of a final pricing decision.

Transportation

Transportation arrangements for the movement of crude from the Reserve will be the responsibility of the private sector. Current plans are to make known the availability of SPR oil, with the private sector making the pipeline and shipping arrangements necessary to move the oil to where it is needed.

It is under these conditions that SPR oil will best substitute for oil lost due to an interruption.

Much of the analysis conducted to determine transportation capability was discussed in Chapter V. The objective of most analysis in this area to date has been to show the transportation feasibility associated with drawing down the Reserve under a variety of rates and interruption situations. Based on these extensive analyses, it has been concluded that SPR crude oil located in the Gulf Coast area can be utilized in available refining and transportation systems such that petroleum products can be equitably distributed to all areas of the United States. Thus, it was found unnecessary at this point to plan for any major Federal role in transporting petroleum from the Reserve.

Of course, major shifts in crude oil shipping patterns are expected to occur. For example, in the case of a major interruption caused by a foreign economic or political embargo, the Gulf Coast, which normally receives a significant portion of foreign imports to this country, is likely to become an "exporter" of SPR oil. Significant amounts of oil will also be distributed from the Reserve through major nearby pipelines such as Capline, Texoma, and Seaway.

It also is significant that a major part of the Nation's refinery capacity exists in the Gulf Coast area. For these refineries, substantial quantities of oil may be secured from the Reserve by pipeline or barge. This condition frees significant tanker capacity to move SPR oil to the East Coast and the Caribbean refineries. Further, the total requirement for shipping in an embargo situation is greatly reduced due to the difference in shipping transit time between domestic ports and the former ports of origin. However, even though the total shipping requirement would be reduced, the need for U.S.-flag shipping tonnage would be increased. This is because of the large number of foreign-flag ships now bringing imports to the United States which would be ineligible for carrying SPR oil between United States ports due to provisions of the Jones Act. Based on analysis by the U.S. Maritime Administration, there is sufficient U.S.-flag capacity to meet this demand. But in an emergency, it is planned that the Jones Act would be temporarily waived to allow the use of foreign flag ships for transportation between U.S. ports if U.S.-flag ships are not available.

While the primary responsibility for transportation will be left to the private sector, the analysis of transportation facilities required for the drawdown and movement of SPR oil between sites and refineries is an integral part of the over-

all SPR design configuration. To the extent practicable, SPR distribution will utilize existing distribution facilities. More facilities such as added docks and pipelines to terminals near the storage sites will be provided if it is determined that added capacity is needed to ensure delivery of SPR oil up to the maximum drawdown rate. In fact, the essential element in the design of the Reserve has been to ensure that transportation capabilities will exist to move the SPR oil to refiners and their petroleum products to the consuming markets, and to ensure the equity of this distribution through the allocation process.

Management and Operations

The Reserve will require many operational procedures to ensure its proper management before and during drawdown. Among the representative procedures are those associated with:

- Daily on-site monitoring of the Reserve at individual SPR sites to include inspection activities, security measures, and operational readiness preparations;
- Operational procedures for interfacing drawdown at specific sites with industry scheduling, providing for quality control measures, and guarding against spills of SPR oil; and
- Financial controls integrated with "rights to buy", prices by type of crude issued, and handling of revenues.

To ensure a rapid response capability, all such procedures will be developed, specific responsibilities assigned, tested through simulation exercises, and put in place well in advance of their actual need. This proposed blueprint for action will also provide time-sequencing of required activities, from recognition of an interruption to completion of the Reserve's use.

CHAPTER VIII

IMPLEMENTATION OF THE PLAN

PROPOSED SCHEDULE OF SPR DEVELOPMENT

It is planned to have 150 MMB of oil in storage by December 22, 1978, 325 MMB by the end of 1980, and 500 MMB by the end of 1982. Although an intensive and disciplined effort will be required to meet the schedule mandated by the EPCA, FEA proposes to depart from that schedule in only one particular, discussed below, and believes that it is possible to comply with the remainder of the schedule; if it should later appear that it will not be feasible to meet this schedule, FEA will so advise the Congress and make appropriate recommendations.

The EPCA provides that, to the maximum extent practicable, the Reserve shall contain crude oil equal to the volume of crude oil imports into the United States during the three consecutive highest import months in the 24 months preceding December 22, 1975 (approximately 500 MMB). The Reserve is to be 10 percent complete in 18 months from the date of enactment; 25 percent complete in three years; 65 percent complete in five years; and fully implemented in seven years. Section 154(a) stipulates, also, that the Reserve (or Early Storage Reserve, if this Plan were not to become effective) is to contain not less than 150 million barrels of petroleum by December 22, 1978.

The proposed schedule set forth in the EPCA for development then is:

- 10 percent, or 50 MMB, by June 22, 1977;
- 150 MMB, by December 22,1978;
- 65 percent, or approximately 325 MMB, by December 22, 1980; and
- 100 percent, or approximately 500 MMB, by December 22,1982.

It is planned to meet those milestones, except for the 50 MMB by June 22, 1977.

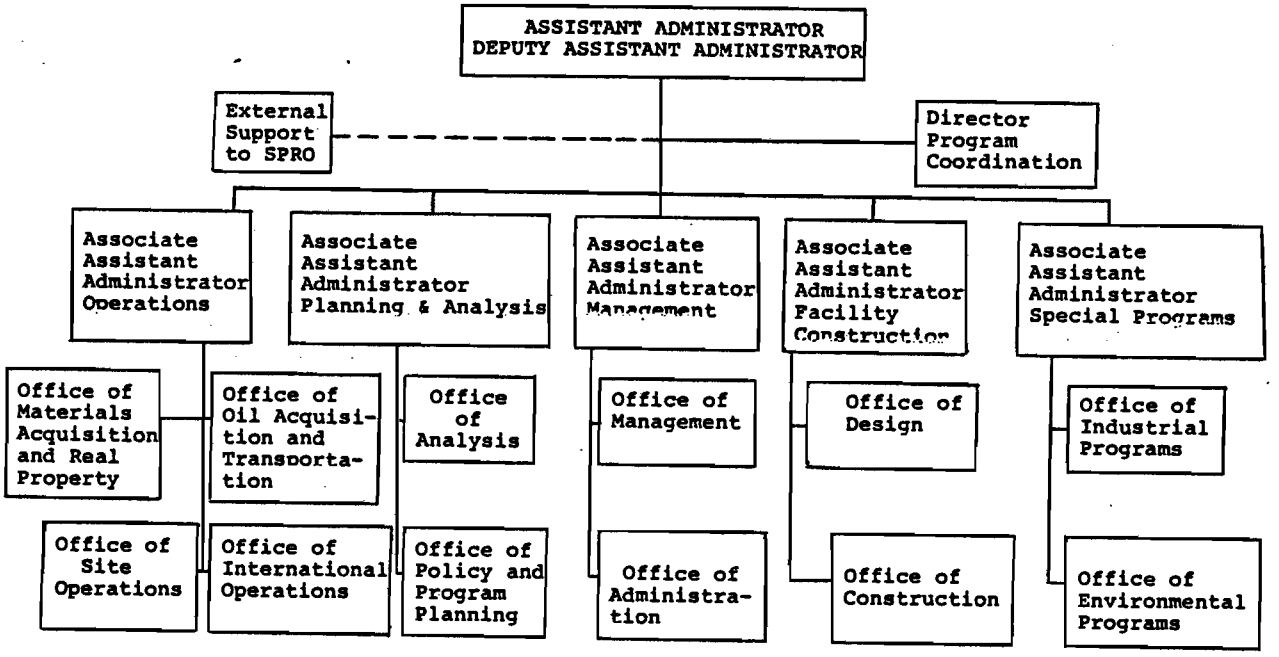
PROGRAM MANAGEMENT STRUCTURE

The Reserve development effort will be managed by the Office of Strategic Petroleum Reserve (SPRO) in the Federal Energy Administration. Figure VIII-1 shows the current organization structure of that Office.

Figure VIII-1

OFFICE OF STRATEGIC PETROLEUM RESERVE

ORGANIZATION CHART



SPRO, which is headed by an Assistant Administrator of FEA, now has a staff of about 125 employees, and this will be expanded to about 150 by mid-1977, as additional design, construction, oil procurement and management specialists join

the Office. The additional projects for the full SPR will require some increase in staffing.

As planned, the staffing of the SPRO has been limited to this minimum level by a high utilization of existing Government and private expertise to develop the Reserve in the most efficient and expeditious manner. For example, the Corps of Engineers' expertise is being used for site appraisals and acquisition. The extensive experience of the Defense Fuel Supply Center may be used in the oil procurement process. The Maritime Administration's knowledge of ocean shipping and tankers is being utilized in planning the Reserve and the distribution system. The Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Coast Guard and other agencies are providing advice and assistance in identifying and ameliorating environmental hazards.

In the development of facilities, FEA plans to utilize two technical management contractors: an Executive Engineer and a Construction Manager. These contractors will bring extensive experience in the design and construction of the types of facilities required for the Reserve. The specific responsibilities of these two contractors are discussed in Chapter IV. The site specific design work and actual construction of facilities also will be performed by private contractors. The Executive Engineer and Construction Manager will play key roles in assisting FEA in the management of that contracting effort. Figure VIII-2 displays the relationships between FEA and the primary design and construction contractors.

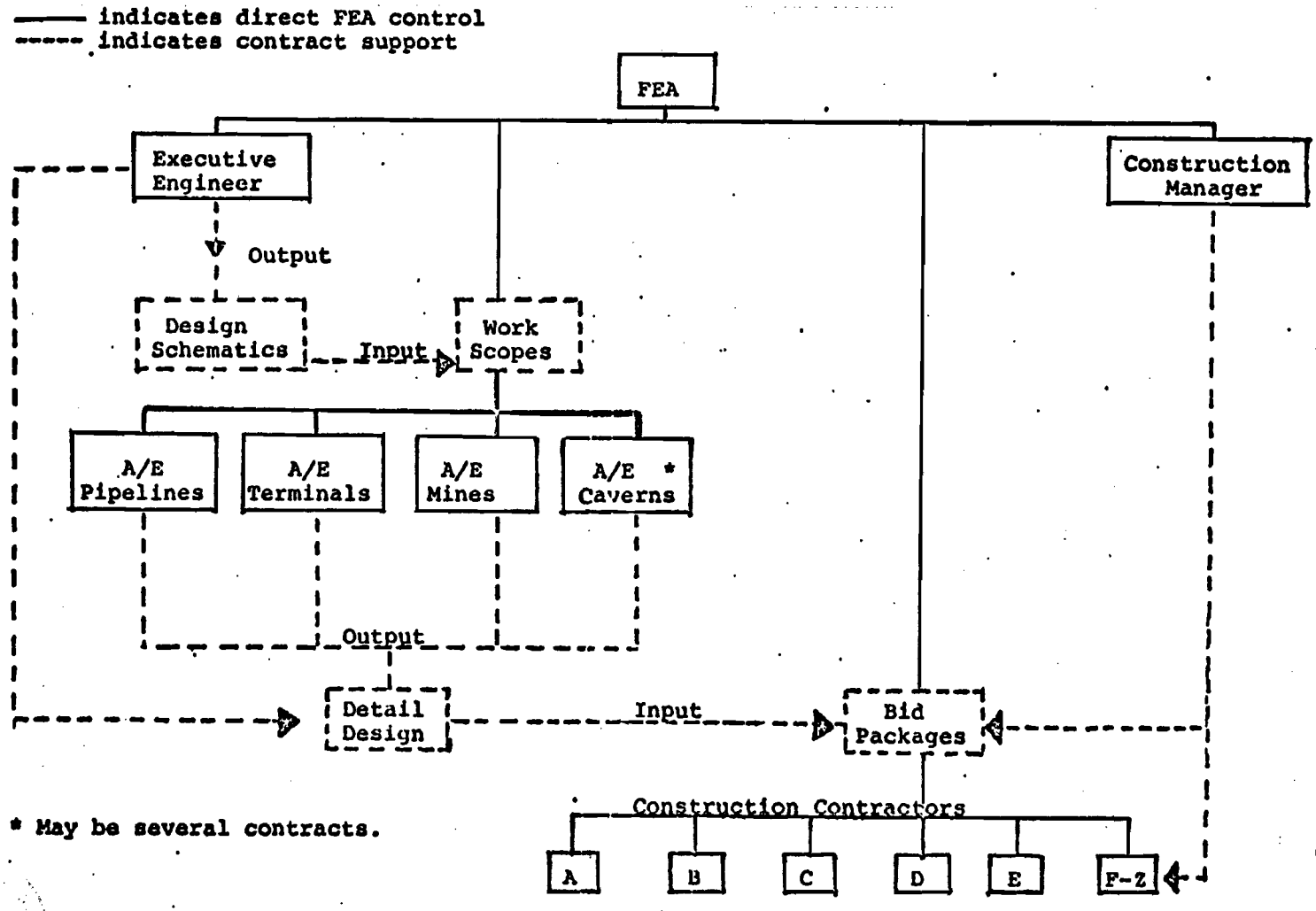
KEY EVENTS IN IMPLEMENTING THE SPR PLAN

The development of a system as large and complex as the proposed SPR entails thousands of important actions that are critical to the successful achievement of the Plan. These actions can be categorized, however, into a relatively few major actions or events to help provide a better perspective of the entire effort and to show the general interrelationship among the actions or events.

Figure VIII-3 presents a relatively simple graphic display of the major events or objectives that must be achieved in implementing this Plan. It depicts the major interrelation-

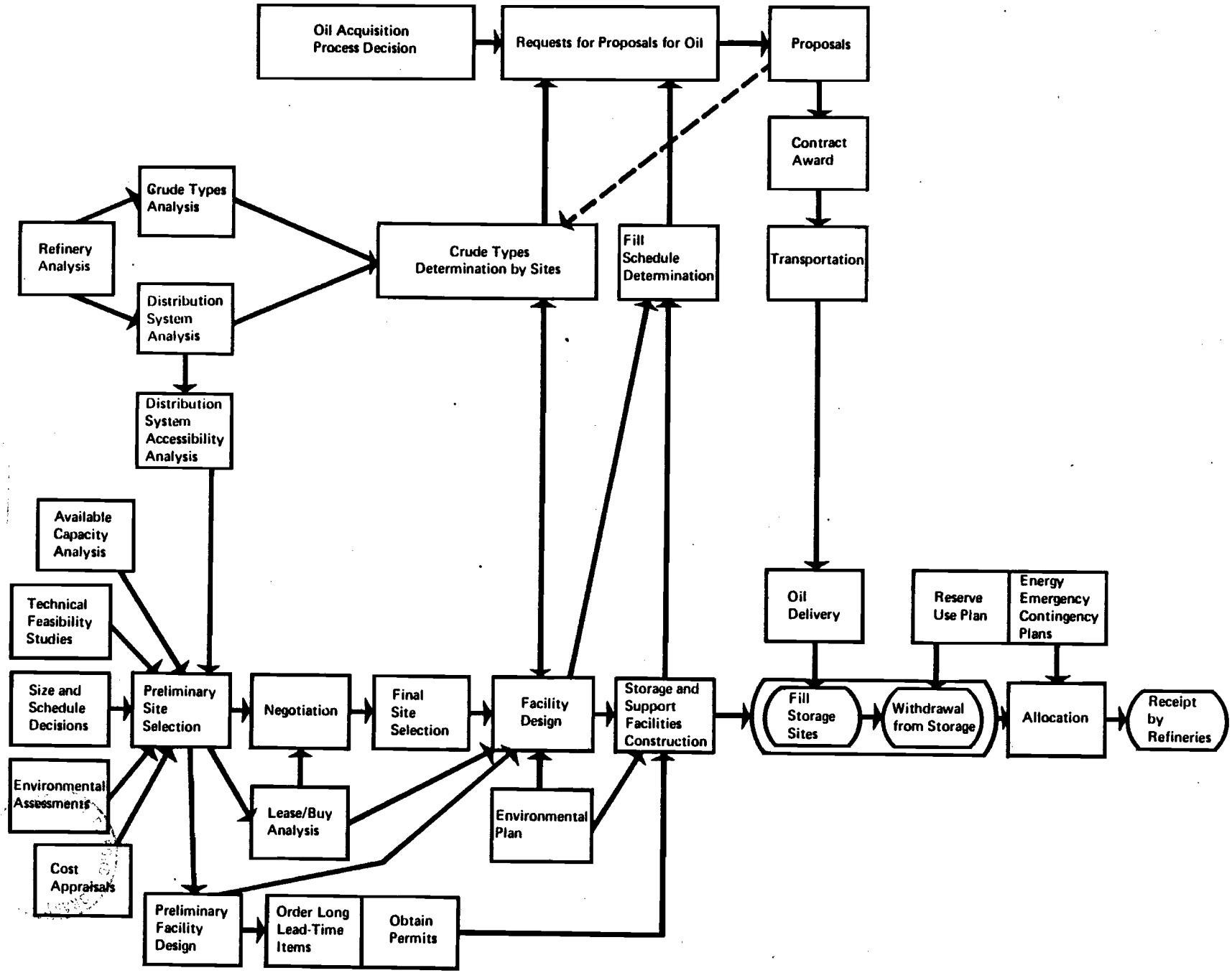
Figure VIII-2

FEDERAL/CONTRACTOR RELATIONSHIPS/SPRO



e VIII-3

Major Implementation Actions



ships among the events, and provides a feel for the key milestones.

This simple display does not attempt to show the time spans involved with each event, or establish specific dates for accomplishing the tasks. These are being developed in great detail as part of the program's working plan and management information system.

The general description of the implementation events shown in Figure VIII-3 will apply to the development of the 150 MMB for the Early Storage Reserve, and most of the process will be repeated for the development of the remaining portion of the Reserve.

For purposes of explaining the implementation plan, six "key" events have been selected. These are discussed below, with an explanation of the major factors affecting those events and some of the problems that must be faced in achieving the objectives.

Selection of Storage Sites

The preliminary selection of storage sites is required prior to beginning official negotiations or other actions to actually acquire the desired sites. The preliminary site selection will identify those sites that appear to be the most desirable based on all the information that can be obtained prior to official efforts to acquire the sites.

As depicted in Figure VIII-3, there are many major items of information that must be obtained and analyzed before making the preliminary site selections. These include information on the amount of existing, usable storage space; the technical feasibility of storing oil at the sites; the accessibility of the sites to the petroleum distribution system of the country; the assessment of the environmental impacts of using the sites for the program; and the relative costs of using the sites.

Each of these information development tasks represents a major effort. For example, environmental impact statements (EISs) must be prepared for the program as a whole and for each site which is an alternative candidate for inclusion in the ESR. These statements are required before final site selection decisions and construction can begin, to assure that environmental considerations are a part of the decision process. The statements provide the assessment needed to ensure that environmental hazards are identified and, to the extent

practicable, ameliorated. FEA's experience has been that it takes 13 months, on the average, to develop the necessary information to prepare a draft statement, circulate it for comment, and prepare a final EIS.

The preliminary site selection process is being conducted in two phases. The first phase was the selection of several "candidate" storage sites from among hundreds of possible sites. As discussed in Chapter IV, eight candidate sites have been selected for the ESR. These sites are being examined in much more detail to obtain the necessary data on environmental impacts, costs, accessibility, etc., to permit site selection.

When this information is available, a site selection decision can be made. For the ESR sites, it is expected that the necessary information will be available early in 1977. Based on that information, the best grouping of sites will be identified as the first priority for acquisition. It is expected that only three to five of the eight sites may be needed for the ESR.

This site selection process will be basically repeated for selecting any additional sites needed for the entire 500 MMB SPR. Initial data collection efforts for those sites are already underway, and site selection is expected in late 1977 or early 1978.

Negotiations will be conducted with the owners or lessees of the selected sites. The negotiation process may involve consideration of lease versus purchase of the site, or other acquisition or utilization arrangements.

If any of the initially selected sites are subsequently found to be unacceptable, one or more of the other sites will then be selected for negotiation. The selection of the replacement site or sites will be based on forming a new grouping of sites which will be suitable for meeting the petroleum distribution requirements of the Reserve.

Upon completion of the negotiation process for the sites, they will be acquired by purchase, lease, or by purchase after condemnation proceedings, if necessary. For the ESR, it is expected that the sites will be acquired in the first half of 1977. Sites for the remainder of the SPR are expected to be acquired in late 1977 or early 1978.

Design of the Facilities

Detailed site design will be completed as early as possible, to permit construction to start soon after the sites are made available. The type and amount of design work will vary among sites depending on such factors as the types of facilities already in place, the accessibility to the petroleum distribution system for fill and withdrawal, and the type and size of storage space involved.

The facility design will have to accommodate the type or types of crude oil that are to be stored at each site. The design effort also may identify particular opportunities which could lead to a change in decisions on the crude types to be stored at a specific site. There will be a continuing interaction between the facility design process and the crude oil type decisions for each site.

The facility design effort will include design of the facilities associated with the storage site itself, as well as facilities for access to the site for fill and withdrawal. This may include pipelines, terminal facilities and docks. However, every effort will be made to use existing facilities, or facilities to be developed by others, including pipelines, docks, tanks, etc. These might be leased, purchased or otherwise contracted for if such usage would be cost effective and meet the program objectives.

In conjunction with the design work, an environmental plan will be developed for each site. This will ensure that the designs for each site will best meet the program objectives with the minimum adverse environmental impact.

The preliminary design effort will already be well underway when the sites are acquired. A substantial amount of design work will have been done on the candidate sites as necessary to assist in final site selection decisions. Additional detailed design work will be underway during the negotiation and acquisition process. By the time the sites are actually acquired, a significant portion of the design work will have been accomplished, and plans and specifications for bidding will be available. This will permit start of construction at some sites shortly after the sites are acquired. Design

efforts will be phased to continue into the construction effort.

As the facility design proceeds, a specific oil fill schedule will be established for the site or for particular storage cavities at the site. This schedule will be necessary to permit proceeding with the oil procurement process.

The facility design process and schedule is discussed in more detail in Chapter IV.

Construction of the Facilities

For the ESR sites, the highest priority will be given to preparing the sites and associated facilities to begin filling with oil as soon as possible. Those facilities that will be needed only for withdrawal at a high daily rate will receive second priority, but will be developed in time to permit quick withdrawal of the Reserve before fill is completed.

This approach will result in substantial petroleum in storage at a site before all construction is completed. These initial amounts of storage could be withdrawn during an interruption, but at slower daily rates than will be feasible when the construction is complete.

Certain long lead time items of hardware are being procured in late 1976, to assure delivery in time to meet construction schedules. Items being ordered are those that are expected to be needed for some or all of the ESR sites.

Permits will be required prior to starting certain construction activities such as dredging, disposal of spoil, etc. The process of obtaining permits must be initiated far enough in advance so as not to impede timely availability of the facilities.

The process and schedule for construction of facilities is discussed in more detail in Chapter IV.

Determining Crude Types to be Stored at Each Site

To assure that the oil in storage will be useful during an interruption, it will be necessary to store the appropriate type of crude oil at a site that can be used by those refineries that are likely to be served by the storage site. As discussed in Chapter III, it is planned to store only two or three types of crude oil. One would be an intermediate grav-

ity crude with moderately high sulfur content. The rest would be selected from three types of low sulfur crude.

It is expected that no site will contain more than two types of crude, i.e., a high sulfur and a low sulfur type. Some sites may contain all high sulfur or all low sulfur crude. The decision on the types and percentage mix at each site will be based on the analysis of the needs of the refineries that are expected to be served from the site. A site that serves only pipelines to the interior of the country may require a different mix than a site that serves only tankers going to other ports, for example.

The proper mix of crude types will be determined for each site in conjunction with the final site selection process and facility design. This will be done for the ESR sites, and will be repeated when the remaining sites are selected.

The crude type determinations may be revised over time as new sites or cavities are preparing for fill, to reflect the results of continuing analyses of refinery needs, availability of oil, and sales prices offered in the procurement process.

The crude types determinations, and the fill schedules, will provide the basis for requests for proposals to procure the oil.

Delivering the Oil into the Facilities

The major milestones set forth in the EPCA relate to the amount of oil actually in storage. The oil fill process will include the development of requests for proposals for the oil, awarding contracts, arranging transportation to the area of the sites, and then moving the oil into the storage facilities. The request for proposals will be based on the crude type determination and the fill schedule for each site. The procurement tasks will be carried out in accordance with the decisions regarding the oil acquisition process, which is expected to include a modification of the Crude Oil Entitlements Program to permit domestic sellers to earn entitlements benefits for crude oil sold for the Reserve.

Contracts will be awarded for delivery of specific types of oil to specified sites on an agreed schedule. To assure delivery of oil to sites on schedule, the procurement process

will begin about six months prior to the desired delivery date.

It is planned to begin delivering oil to the ESR sites in August 1977. The rate of delivery will increase in the following months, to reach 150 MMB of oil in storage in December 1978. Oil will continue to be delivered to fill the remaining capacity of the sites selected for the ESR, which could possibly accommodate about 240 MMB. By that time, the expanded or additional sites for the full 500 MMB are expected to be ready to begin filling.

The oil acquisition process is discussed in more detail in Chapter III.

Use of the Reserve

The effective use of the Reserve will be a critical part of the entire implementation effort. If the use of the Reserve is not effective, its value will be substantially reduced. Accordingly, high priority is being given to developing an array of contingency plans for using the Reserve. These plans will be an integral part of broader contingency plans for responding to interruptions, including plans for energy conservation and for allocating available petroleum and refined products.

Contingency plans are being prepared and will be ready for use by the time there is a usable amount of oil in the Reserve.

POTENTIAL FOR DELAYS

In implementing the Reserve development plan, particularly close attention is being given to those activities which have frequently delayed major construction projects.

A major potential area for delays is the environmental review process, and obtaining the necessary permits for construction and other development activities. Substantial effort has already gone into the environmental review and permit processes in an effort to assure development of the Reserve on schedule.

FEA initiated its formal environmental review of the SPR with the publication of a draft Programmatic Environmental Impact Statement on June 6, 1976. During the review period, comments were received from other Federal agencies, state and

local agencies, and private organizations. The final programmatic EIS, which responds to these comments, will be published in December 1976.

Between September 1976 and January 1977, the FEA will publish draft EISs for eight candidate early storage sites--five solution-mined salt cavities and three conventional mines. Comments have been received on the first group of five draft site-specific EISs, and final EISs are now in preparation for these sites. The draft EISs for sites in the two remaining groups will be published by January of 1977. A similar environmental assessment process has been initiated for candidate storage sites suitable only for later phases of the program, and draft EISs will be published on these sites in mid-1977.

FEA also must comply with the regulatory and permit requirements of other Federal agencies and with the substance of state and local requirements concerning air, water, and noise pollution. FEA has identified the nature and location of proposed facilities and activities at each candidate site, and reviewed all relevant statutes and regulations. Regional offices of Federal agencies, as well as state and local agencies with applicable regulatory authority, were identified and contacted to determine agency practices and procedures. All relevant statutes were reviewed, and application forms were obtained.

FEA has identified several types of requirements for protection of the environment that could potentially delay the program. These include EPA requirements for discharge permits, as well as regulations for underground brine injection and hydrocarbon emissions; requirements for Bureau of Land Management easements for brine disposal pipelines on the Gulf of Mexico Outer Continental Shelf; approvals from the Corps of Engineers for dam and levee crossings, and dredge and fill operations; and approval of the Advisory Council on Historic Preservation and consultation with the State Historic Preservation Officers for construction on potentially significant historic sites. The risk of delay can best be minimized by close cooperation by all regulatory agencies in the design and planning of site development. The environmental assessment effort is discussed in detail in Chapter XI.

There are a number of other possible occurrences that could delay construction of required facilities. One area that is being given close attention is the procurement of certain equipment and supplies which have long manufacturing lead times. FEA is proceeding with procurement of such items now

to try to avoid construction delays when the sites are acquired.

Electric power requirements during construction of storage sites will be substantial, and efforts are underway to ensure that adequate power will be available when needed. Any deficiency in power supplies could delay the development of the caverns.

Other factors which could cause delays during construction are lack of industry bids for the construction work, labor problems, severe weather and unforeseen problems at particular sites. It also is recognized that compliance with the complex set of applicable procurement, real estate acquisition, and other laws and regulations could delay construction.

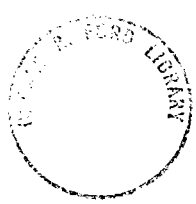
As discussed in the previous section, several actions are being taken to expedite site acquisition, agreement with owners of existing petroleum distribution systems, facility design and construction, and oil delivery. In spite of the best efforts to minimize delays, however, problems may arise that will make it extremely difficult to meet the planned development schedule.

CHANGE TO THE LEGISLATIVE SCHEDULE

As noted in the Early Storage Reserve Plan, FEA has found that it is not practicable to meet the first legislative proposal in regard to the fill schedule of 10 percent, or approximately 50 million barrels, by June 22, 1977. FEA does not expect to have stored that amount of oil until early 1978.

The principal facilities of the Reserve are underground excavations leached from salt domes, and salt, hematite, and conventional limestone mines. As noted in Chapter IV, these types of facilities offer maximum flexibility for distribution, security, the lowest possible acquisition, construction, and maintenance costs, and least environmental impacts consistent with program objectives. Filling of the ESR sites will begin in mid-1977 after completing EISs, site acquisition, design, and construction requirements.

Other types of facilities, particularly steel tanks and idle oil tankers, might have been acquired for use in meeting the



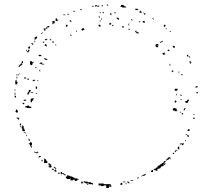
June 1977, 50 MMB target. To have done so, however, would have involved significant environmental and economic costs.

The use of aboveground steel tanks presents serious concerns regarding damage to the environment. Generally, about one hundred tons of hydrocarbons are emitted from each million barrels of oil stored in steel tanks each year, compared to negligible hydrocarbon emissions from underground storage facilities once they are completed and filled.

The added economic cost of using steel tanks for storage would be very large. Specifically, it is estimated that it would cost $90 million to $150 million each year, depending upon the location and type of facilities acquired, to lease sufficient steel tank capacity to store 50 MMB of oil. It is unlikely that adequate tank capacity would be available even at this cost, unless industry reduced its inventories to accommodate the SPR needs, which would be counterproductive. The amount of money spent for leasing steel storage tanks for one year could be used to acquire at least as much permanent storage space in underground facilities.

The use of idle oil tankers for floating storage also has been analyzed, but it is considered to be an undesirable means of storing large quantities of oil primarily because of environmental hazards. A proposal has been studied which would provide for purchasing excess foreign tankers on the scrap market and anchoring them in clusters at sheltered sites off the U.S. coast. The U.S. Coast Guard is concerned about the environmental hazards of such storage. Catastrophic pollution damage could result from spills resulting from collision, storms, or sabotage. Although it is estimated that use of excess tankers would be less costly than onshore steel tanks, such costs would be at least 100 percent more than salt domes or mines, for permanent storage. The potential use of tankers is discussed in more detail in Chapter IV.

FEA finds that the costs and environmental hazards of meeting the proposed 50 MMB storage objective by June 1977 are so undesirable that it would not be practicable to meet that schedule.



CONSIDERATION OF OTHER CHANGES IN THE SCHEDULE

FEA has concluded that it would not be desirable to delay the development of a 150 MMB Reserve by December 1978, 325 MMB by December 1980 and 500 MMB by December 1982. The analysis of potential petroleum interruptions, and the losses that could result, shows that the Reserve should be developed to the 500 MMB level as rapidly as possible under an economically and environmentally sound development program.

The present estimates of the time required to develop the Reserve indicate that it will not be feasible to significantly accelerate the schedule. The time required to thoroughly consider potential environmental impacts, and to analyze development options to minimize those impacts, will significantly reduce the time remaining for actual facility development. Also, the pace of the development, particularly for the leaching or excavation of new cavities, will depend heavily on the ability to dispose of brine or excavated material in an environmentally acceptable manner. FEA believes that it will require a very intensive management effort to develop the Reserve on the currently planned schedule in a cost effective manner and with minimal impact on the environment.

CHAPTER IX

COST OF THE STRATEGIC PETROLEUM RESERVE

SUMMARY OF COSTS

The total cost of a 500 million barrel Strategic Petroleum Reserve is estimated to be between $7.5 and 8 billion dollars. Of the total cost, approximately 89 percent is for the acquisition and transportation of the crude oil, and eight percent is for the acquisition and construction of storage facilities. About two percent of the estimated cost is for filling, maintaining, and managing the Reserve.

Table IX-1 summarizes the currently estimated costs for a 150 MMB and a 500 MMB storage system.

A broad range of factors may cause these estimates to vary, including oil price changes, the extent to which the Crude Oil Entitlements Program is used in acquiring the oil, variations in the cost of transporting the oil, and inflation, particularly on the construction elements of the program. The major variables are addressed briefly in this chapter under each of the major cost categories of the program.

For each candidate location, estimates have been made of the cost of the site acquisition, architectural and engineering design, construction and operation of the sites and related facilities (including pipelines, port facilities, and other distribution requirements), and environmental control. These costs will be used to compare the various sites when final selections are made.

The cost estimates used in this chapter are limited to gross Federal expenditures for developing, filling and managing the Reserve. These estimates do not discuss net costs to the U.S. economy or ultimate net costs to the Federal Budget. For example, it is expected that the costs of the oil to be stored will be recovered when it is sold, either during a petroleum supply interruption or upon reduction or termination of the Reserve.

Table IX-1

DISTRIBUTION OF COSTS SUMMARY

(Dollars in Millions)

CATEGORY	150 MMB PROGRAM DOLLARS	150 MMB PROGRAM PERCENT	EXPANSION TO 500 MMB DOLLARS	EXPANSION TO 500 MMB PERCENT	500 MMB PROGRAM DOLLARS	500 MMB PROGRAM PERCENT
Sites	58.1 1/	2.6	26.0	0.5	84.1	1.1
Construction	242.3	10.9	364.0	6.6	606.3	7.9
Oil Acquisition 2/	1,719.0	77.7	4,640.1	84.7	6,359.1	82.6
Operations 3/	9.2	0.4	66.3	1.2	75.5	1.0
Administration	32.6	1.6	34.3	0.6	66.9	0.9
Cargo Preference 4/	150.0	6.8	350.0	6.4	500.0	6.5
TOTAL	2,211.2	100.0	5,480.7	100.0	7,691.9	100.0

1/ Dollars shown provide for storage capacity of 240 MMB.
2/ Oil price assumption shown in Table IX-2.
3/ Operations cost during expansion over 150 MMB includes standby costs at completed sites and fill costs at new sites.
4/ Applicability of Cargo Preference Act to specific crude oil sources and fill schedules is not known at this time. Additional costs of up to $150 million for the ESR and $500 million for the 500 MMB SPR are included above.

MAJOR COST CATEGORIES OF THE RESERVE

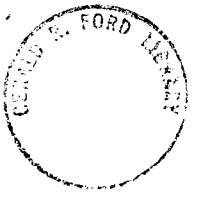
Land Acquisition

As discussed in Chapter IV, salt dome caverns and mines or rock caverns are expected to be used to store the 500 million barrels of crude oil. Acquisition of real estate on which the storage facilities will be developed includes dock sites, pipeline rights-of-way, pump station sites, and other ancillary facilities, as well as the salt domes or mines themselves.

Property will be purchased outright or leased (or, if necessary, condemned), or storage will be obtained under contract. Initial acquisition of real estate will begin in FY 1977 for the tracts required to implement the Early Storage Reserve Plan of 150 MMB in storage by December 1978. Additional land acquisition is planned in FY 1978 to provide the total storage capacity for 500 million barrels by December 1982. Current cost estimates indicate that the expansion of the ESR sites may be the least expensive method of acquiring the needed additional storage capacity. However, it may not be feasible or desirable to expand some of the candidate ESR sites, and a small number of new sites may need to be developed for the full SPR.

Land acquisition costs are estimated to be in the range of 23 cents to 50 cents per barrel for the first 240 MMB of capacity, and 10 cents to 15 cents per barrel for the 260 million barrel increment needed to achieve the full 500 million barrel objective. The reason for the difference in land costs is that existing caverns will be utilized initially. The higher site acquisition costs for these existing caverns will be offset by lower construction costs needed to prepare the caverns for storage. Conversely, the lower land acquisition costs for undeveloped sites to provide additional storage up to 500 million barrels will be offset by higher construction costs required to leach new caverns. The figures used for site acquisition costs in Table IX-1 are at the low end of the cost range and are based on the best information available at the time of preparing this report.

Appraisals of the candidate ESR storage sites are currently being undertaken by the Corps of Engineers and these appraisals, along with negotiations with the owners of the sites, are essential before precise costs can be determined for each site. Should the appraisals and negotiations with the owners



of the ESR sites indicate a lower cost than the Congress has authorized and appropriated, then the savings would be applied to the purchase of oil. If, on the other hand, ESR site acquisition costs turn out to be higher than current estimates, a supplemental appropriation will be requested and funds held for oil purchases will be reprogrammed to maintain site acquisition and facility construction schedules.

Construction of Storage Facilities

The cost estimate for construction covers all actions required to design and construct the storage facilities, including all contracted services and equipment, storage space, pipelines, docks, terminals, tank farms, systems for brine disposal, raw water supply, electrical power, and instrumentation and control required for each project.

As described in Chapter IV, each storage site may require up to 50 miles of pipeline, hundreds of valves, dozens of pumps, electric motors and diesel engines, pump houses, control stations, tanks, dock facilities, wellheads, miles of casings, electrical supply equipment, metering, controls and instrumentation, and numerous other associated equipment and facilities. All must be integrated into a properly working, efficient storage facility constructed within extremely narrow time constraints.

Preparation of the initial approximately 240 million barrels of storage capacity will cost about $242 million dollars (approximately $1.01 per barrel) and will be initiated in FY 1977 in order to meet the goal of 150 million barrels of crude in storage by December of 1978. Technical considerations of the candidate sites indicate that it will be necessary to purchase, construct and convert a number of sites with approximately 240 million barrels of existing storage capacity in order to achieve the 150 million barrels of fill by December 1978. This is because the fill rate at a given site, rather than the site's ultimate total capacity, determines the extent to which it can be filled in the short time allotted.

Approximately 260 million barrels of additional storage capacity at an estimated additional cost of $364 million ($1.40 per barrel) will be required to meet the 500 million barrel objective by December of 1982. Because the filling of the remainder of the 500 million barrel system will be spread over a four-year period, in contrast to the shorter 1977-1978

period for the first 150 million barrels, no excess storage capacity beyond 500 million barrels is necessary.

The difference in estimated construction costs between the initial 240 MMB (at $1.01 per barrel) and the additional 260 MMB (at $1.40 per barrel) was partially explained above under Land Acquisition as the difference between developed and undeveloped sites. The total cost per barrel for both land and construction costs for the 150 MMB ESR is expected to range between $1.24 and $1.51 per barrel and for the additional 350 MMB about $1.50 to $1.67 per barrel. The difference in cost per barrel is attributable to two facts; the cheapest sites available were identified as candidates for the ESR, and development of unleached caverns for the SPR costs more than development of existing caverns. Overall, the combined land and construction costs of the 500 MMB SPR are expected to be between $1.38 and $1.65 per barrel so that the combined costs for land and facilities construction for the 500 MMB system are expected to be between approximately $690 million and $825 million.

This range of $135 million is attributable primarily to the unknown cost of land which, as mentioned above, is currently being resolved by Corps of Engineers appraisals and negotiations with site owners, and variations in construction costs.

Oil Acquisition and Transportation

The cost of oil represents nearly 90 percent of the total cost of the Reserve Program. As presented in Chapter III, FEA plans to purchase oil at approximately the national composite average price (including imports), following Federal procurement laws, with the U.S. sellers participating in a modified Crude Oil Entitlements Program authorized by the Emergency Petroleum Allocation Act.

The estimated cost for oil, shown in Table IX-2, is based on the forecasted national composite average price of crude, which includes weighted domestic production and imports with overseas transportation costs. The estimated costs assume no increases in world oil prices by the major producing countries.

The specific types of low sulfur crude to be purchased for storage will not be finally determined until offers have been received and analyzed. Accordingly, the actual costs may vary slightly because the national average price for crude oil shown in this estimate is based on all crudes, while the

Table IX-2

ESTIMATED COSTS OF CRUDE OIL

Year	Cost per BBL*
1977	11.02
1978	11.62
1979	12.71
1980	13.40
1981	13.40
1982	13.40
1983	13.40
1984	13.40
1985	13.40
1986	13.40

*Cost per barrel shown is weighted average.

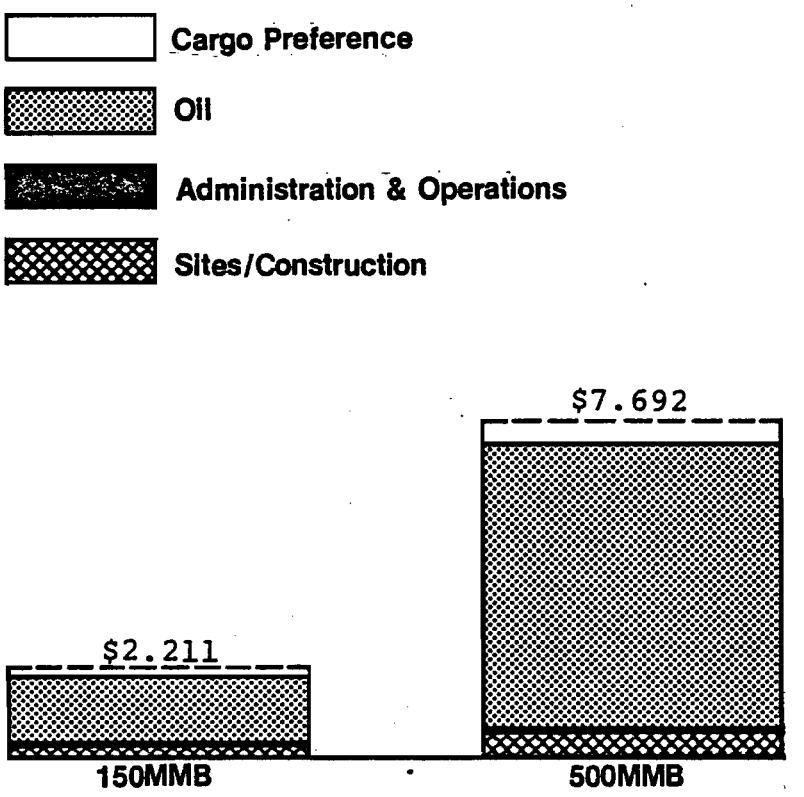
Reserve may use crudes in the middle to upper price range of that total average.

The cost of oil is the driving factor in the total cost estimate for the storage program. The cost of oil as a proportion of the total program is shown graphically in Figure IX-1 for a 150 MMB, and a 500 MMB system.

It should be noted that the Cargo Preference Act requires that 50 percent of all cargo purchased overseas by the Federal Government be shipped on American flag vessels if such vessels are available. Applying this requirement to the Reserve, up to 50 percent of all crude may have to be shipped on American registry tankers, which may result in an increase in the cost of transportation. The extent of applicability of the Cargo Preference Act to specific crude oil purchases and fill schedules over the life of the program is not known at this time.

Cost estimates shown are FEA's best estimate at the present time. Should the price of oil be higher at the time of purchase, or should additional transportation costs be assessed, FEA will request supplemental appropriations to assure delivery of the necessary quantities. Should the price of oil be lower than the estimates, any excess appropriation will be

Figure IX-1
COMPARISON OF 150 MILLION BARREL AND
500 MILLION BARREL STORAGE PROGRAMS



carried over into the next fiscal year in order to fund subsequent oil purchases.

Operations

This cost category represents the actions required to fill and maintain the storage sites. Operations costs for filling both the ESR and the SPR include funding for three shifts, around the clock for seven days a week, at each of the storage sites. Once filled, the sites will require only a base skeleton crew for maintenance and security. Drawdown, however, will require an identical crew as a filling operation. Both the filling operation and the maintenance operation will be under contract and will include personnel staffing and

supportive functions necessary to effectively receive, ship, store, account for and maintain the crude oil program.

Filling the reserve is estimated to cost between 13 cents and 18 cents per barrel. Monitoring and maintenance will average less than one cent per barrel per year during standby. Drawdown costs per barrel should be approximately two cents to three cents less than the initial fill costs because of the shorter emergency time period of 150 days for drawdown during a supply interruption. The greatly reduced labor costs during drawdown, however, should be offset to some extent by significantly increased power requirements of pumping up to 3.3 million barrels per day out of the Reserve.

Refill costs are estimated to be about three cents per barrel less than initial costs because by this time construction will have been completed and the full capacity of the fill systems at each site will be in place.

Administration and Management of the Reserve

This cost category covers the direct costs involved in planning all aspects for the Reserve, including economic and environmental assessments, and the salaries and expenses of the Federal employees responsible for site acquisition, design and construction of facilities, purchase and transportation of crude, and filling and maintaining the Reserve.

Every effort has been made to keep the number of full-time Federal employees to the minimum necessary for the timely and efficient operation of the program. The nature of the program itself is ideal for a high level of contract-funded activities as the program moves through the phases of planning, site acquisition, construction, fill and maintenance of the Reserve. The costs for the administration and management of the Strategic Petroleum Reserve Program are estimated to average around $9 million per year over the first seven years of the program.

These activities are expected to peak in the first few years of the program at approximately $13 million per year; this amount includes about $5 million for the salaries and expenses of about 200 Federal employees and $8 million for contract funds for planning, analysis, environmental and economic impact assessments. In 1980 these activities should begin to taper off as planning and analysis activities are essentially completed and be reduced even further in 1982 to a level of about $5 million per year as construction and filling operations are completed. Beyond 1982 a very small

standby staff will be needed to maintain the Reserve and the distribution plans in the event of a supply interruption. Estimated costs of approximately $67 million through 1982 should be approximately nine-tenths of one percent of the total program cost.

CHAPTER X

ECONOMIC IMPACTS OF ESTABLISHING THE SPR

SUMMARY OF RESULTS

Developing the SPR will produce no major adverse impacts on the economy. Construction and development of the Reserve will result in expanded production of the necessary supplies and equipment without perceptibly increasing prices. Manpower requirements for development of the SPR are expected to increase employment of semi-skilled and unskilled workers in late 1977 and 1978. SPR construction will also increase demand for skilled workers, such as welders, electricians, and pipefitters. These additional manpower requirements are not expected to have any inflationary impact on wage rates.

Gross National Product (GNP) and employment effects of developing the SPR are expected to be generally positive, but small in magnitude compared to levels in the absence of the program. The maximum impact is expected to occur in late 1978 and 1979, when the program could increase the GNP by about $2.8 billion, or 0.15 percent, and could increase employment by about 68,000 jobs, or 0.07 percent.

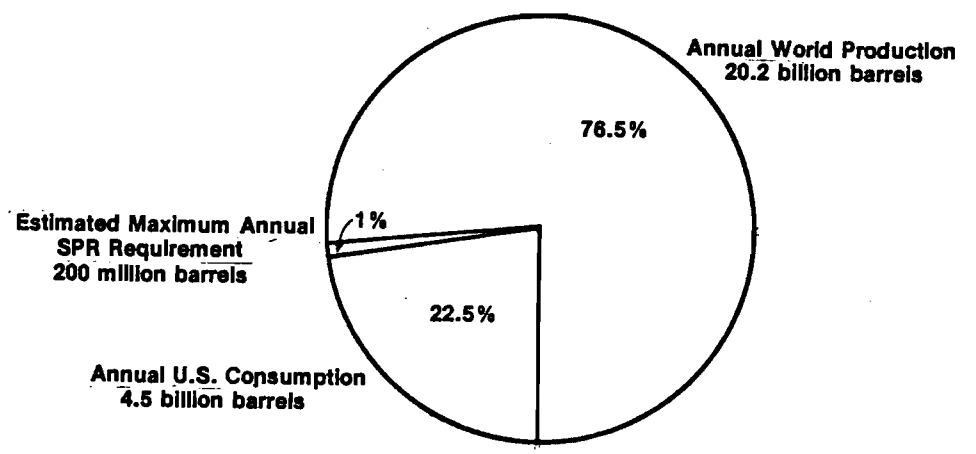
Significant fluctuations in world oil prices are considered unlikely as a result of SPR oil purchases. The maximum amount of oil required for SPR fill in any 12-month period is estimated to be less than 200 MMB. This quantity represents approximately one percent of current annual world production, as shown in Figure X-1. The average annual procurement of oil for the SPR would be only about 100 MMB which would be less than one half of one percent of current annual world production. Because SPR crude requirements are so small relative to annual world production, the SPR is unlikely to support oil proces that might otherwise be declining.

FEA recognizes that a small incremental demand for oil can have adverse effects if markets are tight. FEA plans to carry out its oil procurement so as to minimize any purchases of oil that might impact world prices.

The planned method of acquiring the oil for storage, with participation in a modified Entitlements Program, is expected to increase domestic prices of petroleum products by about five cents a barrel in 1978 and seven cents a barrel during

Figure X-1

Annual SPR Requirements for Crude Oil as a Percent of Annual World Production
(Estimated 1976 Production and Consumption)



the first few months of 1979. Seven cents a barrel would be less than two-tenths of a cent increase per gallon. This price increase would fall to zero upon expiration of crude oil price controls, expected in May 1979. The estimated

Table X-1

EFFECTS OF ACQUIRING SPR OIL AT THE NATIONAL AVERAGE PRICE ON 1978 ENERGY EXPENDITURES BY INCOME CLASS

	Income Quintiles (1973 dollars)				
	Less than $4,401	$4,401-$8,800	$8,801-$13,400	$13,401-$19,500	Over $19,500
Gasoline Expenditure Without SPR (in 1976 dollars)	187.00	447.00	674.00	863.00	1,047.00
Gasoline Expenditure With SPR (in 1976 dollars)	187.38	447.90	675.36	864.74	1,049.11
Fuel Oil Expenditure Without SPR (in 1976 dollars)	83.00	109.00	102.00	132.00	137.00
Fuel Oil Expenditure With SPR (in 1976 dollars)	83.24	109.32	102.30	132.39	137.40
Changes as a Percent Of Real 1973 Income	.022%	.015%	.012%	.010%	.007%

Source: 1973 BLS Consumer Expenditure Survey. Expenditures for 1976 are calculated using average 1973 and January 1976 prices from Monthly Energy Review (FEA) and BLS data. Price deflator for 1976 is from Economic Report of the Presidnet, 1976 (CEA); pp. 61. Estimates on total consumption are taken from National Energy Outlook business-as-usual case and interpolated to 1978.

effects of this slight increase in the cost of petroleum products on different income classes are shown in Table X-1.

Because the planned method of SPR crude acquisition will raise the National Average Price, the increase in cost of crude oil to refiners will be approximately $300 million in 1978 and $165 million in 1979. No significant impact on competition in the petroleum industry is expected from this action. The oil acquisition effort will be carefully monitored to identify and minimize any significant impacts.

There is expected to be no other perceptible impact on competition in the petroleum industry. This is primarily because implementation of an Industrial Petroleum Reserve (IPR) is not planned. An IPR could have a significant impact on the competitive position of some firms.

ASSUMPTIONS

Equipment, material and manpower requirements and their associated costs for the storage facilities were synthesized from characteristics of candidate storage sites. Information was developed from construction feasibility studies and environmental impact assessments of candidate sites.

Assumptions underlying the analysis are as follows:

- Impact assessments are based on a 500 million barrel Reserve consistent with the discussion of size contained in Chapter II.

- Construction is assumed to begin in the first half of 1977 with initial fill occurring in mid-1977. The fill schedule provides for 150 MMB in storage by December 1978, 325 MMB by December 1980, and 500 MMB in storage by December 1982.

- The oil price estimates developed for this chapter were based on an assumed crude oil import price of $13.40 per barrel in 1976. The estimated cost of the oil to the government assumes that the oil is purchased at the National Composite Average Price.

MICROECONOMIC IMPACTS OF DEVELOPING STORAGE FACILITIES

Developing the SPR storage facilities will require the use of a variety of types of equipment, acquisition of large quantities of construction materials, use of substantial amounts of energy, and employment of a sizeable work force. Generally, the types of equipment, materials and labor required are similar to those required for more conventional oil field projects. The principal equipment requirements are drilling rigs and earth-moving equipment. Materials will include pumps, meters, valves, steel pipe, steel plate (for construction of surface tanks) and electrical equipment (to deliver power for the pumps). Manpower requirements will include engineers, pipe fitters, welders and electricians.

This section examines the potential adverse impacts of developing the SPR on the availability and prices of supplies and equipment and on employment and wage levels.

The assumed annual costs of developing and filling the SPR (not including oil acquisition) are under $320 million (1976 dollars) in each year. This amount is small in relation to annual oil field expenditures and suggests that significant adverse impacts of the SPR are unlikely.[1] Of course, significant adverse impacts are still possible if the SPR requirements include an unusually high proportion of the annual output of a particular type of product or manpower category, or if the requirement is highly localized. Such impacts are considered to be unlikely based on the quantities and types of the equipment and manpower expected to be available.

Significant equipment and materials requirements for the SPR are drilling rigs, steel plate, oil field tubular goods, steel pipe, electric power transformers, electric power, and tankers.

Drilling Rigs

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[1] U.S. domestic capital expenditures for petroleum products in 1974 were estimated at $11.5 billion. Domestic exploration and development expenditures in 1974 were estimated at $12.4 billion (Source: The Chase Manhattan Bank, American Petroleum Institute, Basic Petroleum Data Book; April 1976, Section V, Tables 8 and 9.)

During the period 1974-75 following the embargo, drilling activity was intense and drilling rigs were in short supply. Drilling activity has slowed down in 1976, and given the expected net additions to the stock of workable rigs in 1976, some surplus throughout 1976-1977 can be anticipated. The maximum number of rigs required for the SPR in any one period, ten rigs in 1978, represents only 5.6 percent of expected net additions in that year. The SPR requirement in terms of the total stock of drilling rigs is very much smaller. Because the SPR demand is so small in relation to total availability, its impact would be negligible.

Steel Plate

Projected total U.S. production is less than seven million tons in 1976 and will require less than 60 percent of mill capacity to satisfy. While production could increase during the later years of the SPR construction period, about 85 percent of the SPR requirement is needed in 1977 when mills are likely to still be operating at well below capacity. This peak SPR demand will represent only 0.1 percent of domestic capacity. Therefore, the SPR should not affect prices or availability.

Oil Field Tubular Goods

While demand for oil field tubular goods has remained high through 1976, supplies have been available because of excess inventories in the petroleum industry and an overall slack demand for other steel products.[1] Recent announcements by the steel industry of its intentions to re-stock inventories which were depleted in 1974-1975 suggest there will be adequate stocks to meet future demand for oil field tubular goods during the period of SPR facilities construction.[2]

Steel Pipe

As with oil field tubular goods, shortages of pipe could pos-

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[1] Oil Daily, September 30,1976.

[2] Oil Daily, "U.S. Steel Opts to Rebuild 'Down River' Stocks," September 22,1976.

sibly develop and the SPR requirement may divert a small proportion of production from use for other purposes. About 75 percent of the SPR requirement will be acquired in 1977, however, and this quantity should have no discernible impact on price or availability.

Transformers

Consideration of the horsepower rating of pumps required and a reasonable allowance for overload indicates that the major transformers required on a typical site would all fall within the 500 to 10,000 KVa range. Availability is adequate to meet the SPR requirements and no adverse market impact is expected.

Tankers

There is no expectation of a tanker shortage during the period of fill. Idle tanker capacity rose steadily throughout 1975 and remains high in 1976. This condition is projected to persist until 1982.[1]

Electric Power

SPR fill operations will require large amounts of electric power which could amount to 60 megawatts during periods of maximum fill.

The projected generating capacities for utility companies located in the vicinity of candidate sites are ample to meet the assumed maximum demand of 60 Mw for fill in 1978-1979, and still maintain a reserve electrical power capacity at or near 15 percent. Also, sharing agreements exist among most southern Louisiana and eastern Texas utilities. Therefore, no adverse impact is anticipated on power availability or rates.

Other Equipment and Materials

In addition to the items discussed above, there are numerous other requirements. Most of these are standard items of oil

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[1] Oil and Gas Journal, September 13, 1976, pp. 35-37.

field and general construction supplies, and the SPR requirement will be minor in comparison with availability.

Manpower Requirements

Many of the workers required for developing the SPR will be skilled equipment operators. In addition, much of the conversion effort will require craftsmen such as welders and pipefitters, and technicians to install instrumentation and control equipment. Mine conversion would require a somewhat higher proportion of unskilled workers than salt dome development or conversion for demolition of some existing structures in the mines and removal of the debris. Total manpower requirements during the period of construction are estimated to vary between 150 and 1050 workers. The requirements include several skilled categories which may be in short supply, including welders, machinists, electricians, and pipefitters. The unemployment rate for "craftsmen other than carpenters" was low enough in some states which contain candidate storage sites to account for voluntary unemployment between jobs and is regarded as effectively full employment. However, because relatively small numbers of workers are involved and because they are only required for a limited period of time, any resulting impact on real wage rates is likely to be small and temporary.

Development of the SPR is likely to increase employment in semi-skilled and unskilled categories in late 1977 and 1978. It is also likely to have favorable indirect effects on employment in the vicinity of the storage sites. The increased consumer demand for goods and services from the newly employed personnel will stimulate some employment in other occupations.

IMPACT OF OIL ACQUISITION ON WORLD PETROLEUM PRICES

As was stated earlier in this chapter, acquisition of oil for the SPR is not expected to affect world petroleum prices. The maximum SPR requirement for oil in a 12-month period is estimated to be less than 200 million barrels. This is about one percent of current world production and would require an increase of about 1.8 percent in OPEC's production rate. OPEC's shut-in capacity is currently 21 percent of production

and total production capacity is increasing.[1] With the assumption of a continuation of past OPEC price-setting policies, under which prices are set independently of demand for oil or production costs, it is reasonable to expect that SPR fill requirements could be satisfied without any impact on the OPEC price.

IMPACT OF OIL ACQUISITION ON DOMESTIC PETROLEUM PRICES

Oil for the SPR will cost the U.S. the import price of oil, whether or not imported oil is actually stored, because domestically produced oil which is used will be replaced by additional imports. If the government pays the import price, then there will be no effect on domestic crude and product prices. FEA expects to acquire oil for the SPR at approximately the National Composite Average Price, however, by permitting U.S. sellers to receive entitlements on oil sold for the SPR.

Acquiring oil in this manner would have the effect of slightly increasing the national average price, because the proportion of imported crude would be increased by the SPR requirement. Based upon the oil price given earlier, the price increase resulting from this purchase strategy was calculated to be $0.05 per barrel of crude consumed in the U.S. (imported or domestic) during 1978, and $0.07 per barrel during the first five months of 1979, when price controls are scheduled to end and domestic prices are expected to rise to the level of the import price.

MACROECONOMIC IMPACTS

The analysis finds the GNP and employment effects of developing the SPR to be positive but small in magnitude compared to levels in the absence of the program. The government expenditure on storage facilities has effects which, when they are transmitted through the economy, could result in small increases in production, employment and consumption. However, the price increase in crude oil will result in a small

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[1] FEA, Monthly Energy Review, September 1976, page 88: World and OPEC crude oil production rates in June 1976 were 56.9 and 30.2 MMB/D, respectively.

increase in expenditures on petroleum products by consumers, at the expense of consumption of other goods and services.

The effect of increased payments to oil exporting countries is uncertain. Two cases have been analyzed.

Case 1 assumes that expenditures for imported oil are either deposited by the exporting countries in non-interest bearing accounts or are used to purchase U.S. Government securities with negligible impact on U.S. GNP during the period of the SPR program. Case 2 assumes that 50 percent of foreign receipts from sale of the oil returns to the U.S. two quarters later as payment for increased U.S. exports.

Table X-2 shows the estimated total SPR impacts on GNP and employment for the years 1977 through 1984. The two cases reflect the different assumptions on use of U.S. payments to oil exporting countries, as discussed above.

Table X-2

GNP AND EMPLOYMENT IMPACTS OF SPR DEVELOPMENT AND FILL*

	Case 1		Case 2	
Year	GNP	Employment	GNP	Employment
1977	268	6,826	268	6,826
1978	173	1,831	580	11,488
1979	522	12,390	2,849	67,657
1980	456	11,638	1,735	42,022
1981	337	8,662	1,571	37,963
1982	182	4,637	1,233	29,602
1983	68	1,746	180	4,385
1984	24	647	77	1,874

*GNP is in millions of dollars. Employment represents number of jobs.

The maximum impact year for Case 1 is 1979, where the SPR increases GNP by $522 million and employment by 12,390 jobs. These amounts represent only a .03 percent increase in GNP and a .01 percent increase in employment. Likewise, under

Case 2 conditions, SPR development expenditures increase GNP by only .15 percent and employment by .07 percent in 1979.

Either assumption concerning likely responses of export demand from increased payments for foreign oil leads to the conclusion that effects of SPR development represent minor changes relative to total GNP and the total labor force during the 1977-1984 period. They do, however, imply slighly positive economic changes, without significant inflationary effects.

The methodology of the economic impact analysis and more detailed results are presented in Appendix E.

CHAPTER XI

ENVIRONMENTAL ASSESSMENT

Construction and operation of the storage facilities described in Chapter IV will permanently alter to a minor degree some aspects of the environment and temporarily affect others. These environmental changes would be limited to the duration of construction, fill and withdrawal. Virtually no impacts are expected to be experienced during the time that the oil is in storage. To mitigate these potential impacts, FEA is committed to developing the SPR in the most environmentally acceptable manner possible, consistent with the financial and time constraints of the program.

FEA's commitment is shown in three areas: consistency with the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. S4321 et seq.); compliance with other Federal environmental regulations and with the substance of State and local regulations; and preparation of an Environmental Plan to ensure facility construction and operation in an environmentally responsible manner. The details of this environmental review and planning process are described in the next section of this chapter.

The environmental review process that FEA is following has identified a number of environmental impacts that can be avoided or mitigated so that the SPR is consistent with the Nation's environmental goals, as set forth in NEPA. Most of these impacts will be controlled by adherence to specific Federal regulations governing pollutant discharges to the environment, but others will require implementation of control technologies and other procedures in the Environmental Plan that go beyond current requirements. The potential generic and site-specific impacts of the program, along with the measures available to mitigate or avoid them, are summarized in the second section of this chapter. The programmatic and site-specific environmental impact statements prepared for the SPR should be consulted for a more extensive discussion.

ENVIRONMENTAL REVIEW AND PLANNING PROCESS

The environmental review and planning process followed by the SPR consists of three components: consistency with section 102(2)(c) of NEPA, which requires the preparation of environmental impact statements; compliance with other environmental regulations; and development and implementation of an Environmental Plan. The role and status of each of these aspects are discussed below.

Consistency with NEPA

Section 102(2)(c) of NEPA requires that all Federal agencies prepare "a detailed environmental statement on major Federal actions significantly affecting the quality of the human environment." Subsequent legal interpretations of this law have established the need to first publish a programmatic EIS emphasizing program alternatives and total program impacts, followed by site-specific EISs in which local and regional impacts are analyzed in greater detail.

FEA initiated its formal environmental review of the SPR with the publication of a draft programmatic EIS on June 6, 1976. During the review period, comments were received from other Federal agencies, State and local agencies, and private organizations. The final programmatic EIS, which responds to these comments, is being published on December 16, 1976.

The draft programmatic EIS examines the socioeconomic and environmental impacts of storing 150 million and 500 million barrels of oil in conventional mines, steel tanks, surplus oil tankers and solution-mined cavities in salt domes. The impacts identified in the programmatic EIS helped to narrow the crude oil storage alternatives to conventional mines and solution-mined salt cavities, and to focus the analysis for subsequent site-specific EISs. Between September of 1976 and January of 1977, the FEA will have published draft EISs for eight candidate early storage sites--five solution-mined salt cavities and three conventional mines. These EISs were published in three groups, each consisting of site alternatives that fulfill a different program purpose. Comments have been received on the first group of draft site-specific EISs, and final EISs are now in preparation for these sites. The comments on draft EISs for sites in the two remaining groups will shortly be solicited. A similar environmental review process has been initiated for candidate storage sites suita-

ble only for later phases of the program, and draft EISs will be published on these sites in mid-1977.

Compliance with Other Environmental Regulations

In addition to being consistent with NEPA, FEA must also comply with the regulatory and permit requirements of other Federal agencies, in particular the U.S. Army Corps of Engineers; the U.S. Environmental Protection Agency; the U.S. Coast Guard; and other safety, historic, and wildlife preservation agencies. As a Federal agency, FEA is not legally required to obtain State and local permits to engage in a Federal activity within any state.[1] However, Federal statutes (specifically the Clean Air Act, the Federal Water Pollution Control Act, the Noise Pollution Control Act of 1972, and the Coastal Zone Management Act of 1972) and Executive policy (particularly Executive Order 11752) require FEA to comply with the substance of State and local requirements concerning air, water, and noise pollution. The extent of these regulations and the lead times required to store 150 MMB of oil necessitated FEA's identifying permit requirements and initiating agency coordination at an early stage of program development.

To this end, the FEA has prepared a handbook of regulatory requirements relevant to the SPR program for use by its environmental staff. In preparing this handbook, FEA identified the nature and location of proposed facilities and activities at each candidate site, and reviewed all relevant statutes and regulations. Regional offices of Federal agencies, as well as State and local agencies with applicable regulatory authority, were identified and contacted to determine agency practices and procedures. All relevant statutes were reviewed, and application forms were obtained. The Federal regulatory requirements applicable to the SPR are summarized in Table XI-1.

In the course of preparing the handbook, FEA identified several types of requirements for protection of the environment that could potentially delay the program. These include EPA requirements for discharge permits, as well as regulations

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[1] An exception is permits allowing the Federal Government the use of local public land. Such permits must be obtained, unless the necessary interests in land are acquired by eminent domain.

Table XI-1

FEDERAL REGULATORY REQUIREMENTS

AGENCY	APPROVALS/OTHER REQUIREMENTS
Advisory Council on Historic Preservation	No permits required The responsible agency must consult with the Council and the State Historic Preservation Officer to identify all properties within the area of potential impact that are included in, or eligible for inclusion in, the National Register, and determine if the project may have adverse effect. If the responsible agency or Council determines that the project may have an adverse effect on such a site, the agency must attempt to negotiate an agreement with the Council and the SHPO concerning avoidance or mitigation of the adverse effect. If agreement cannot be reached, the project must be delayed until the Council submits comments.
Office of Interagency Archeological Services (IAS)	No permits required. If the responsible agency is notified by the State Historic Preservation Officer, or any other appropriate historical and archeological authority, that its activities may cause the loss of significant scientific or historic data (i.e., included in or eligible for inclusion in the National Register), it must notify the Secretary of the Interior in writing and provide him with pertinent information about the project. IAS, carrying out the functions of the Secretary of the Interior, must then be given an opportunity to conduct survey and recovery operations.
Bureau of Land Management (BLM)	Right-of-way required for brine disposal pipeline on Gulf OCS (3-mile limit for Louisiana and 3-league limit for Texas). If Gulf OCS pipeline is used solely for water intake, BLM probably has no authority. If a state's coastal zone management program has been approved by the Secretary of Commerce, the applicant must submit a certification to NOAA or BLM, agreed to by the state, that the proposed activity complies with the program.
U.S. Coast Guard	Letter of intent to operate and operations manual must be filed with appropriate Captain of the Port before commencing operation of any oil transfer facility.

Table XI-1(Continued)

FEDERAL REGULATORY REQUIRMENTS continued

AGENCY	APPROVALS/OTHER REQUIREMENTS
U.S. Coast Guard	Notice of discharges of oil and hazardous substances must be given to appropriate Coast Guard office.
	Design and operation of waterfront facilities handling combustible liquids in bulk must comply with Coast Guard regulations.
	Design and operation of vessels must comply with Coast Guard regulations.
	Permit required for construction of causeways and bridges on or over navigable waterways. Where Coast Guard approval is required, specific authorization by Congress or, in some cases, by the state legislature is also required.
	If a state's coastal zone management program has been approved by the Secretary of Commerce, the applicant must submit a certification, agreed to by the state, that the proposed activity complies with the program.
U.S. Army Corps of Engineers	Permit required for virtually any construction activity, including excavating, dredging, disposing of dredged spoil, or filling in bodies of surface water or adjoining wetlands. Construction of pipelines and cables under or over waterways is included.
	Permit may be required for any other activity that may affect the navigable capacity of any waterway.
	If a state's coastal zone management program has been approved by the Secretary of Commerce, the applicant must submit a certification, agreed to by the state, that the proposed activity complies with the program.
U.S. Environmental Protection Agency (EPA)	NPDES permit required to discharge into surface waters. Construction may commence before permit is obtained.
	SPCC plan must be prepared for nontransportation-related facilities that can reasonably be expected to discharge oil into or on surface waters or adjoining wetlands.
	Permit required for dumping materials other than dredged spoil or fill into surface waters.
	Written notifications and performance test reports must be submitted for construction of petroleum surge tanks and other aboveground tankage for hydrocarbons.

Table XI-1(Continued)

FEDERAL REGULATORY REQUIREMENTS continued

AGENCY	APPROVALS/OTHER REQUIREMENTS
U.S. Environmental Protection Agency (EPA)	EPA expects to formalize its "tradeoff" policy whereby a new major source of a pollutant (one emitting 50 tons or more annually) will be allowed in a non-attainment area for that pollutant if (1) it employs the best available control technology, and (2) existing sources of emissions (which may be owned or controlled by someone else) are reduced by an amount greater than the emissions from the new source.
	Compliance required with all applicable federal, state, and local air quality standards and emission limitations.
	Compliance required with all applicable federal, state, and local water quality standards and effluent limitations.
	Compliance required with all applicable federal, state, and local requirements concerning noise pollution.
	Compliance required with EPA guidelines concerning solid waste disposal.
	If a state's coastal zone management program has been approved by the Secretary of Commerce, the applicant must submit a certification, agreed to by the state, that the proposed activity complies with the program.
U.S. Fish and Wildlife Service (FWS)	No permits required.
	Consultation with FWS required before any project is undertaken that will alter any body of water. FWS recommendations must be incorporated into a report to Congress or to any other agency or person responsible for authorizing the project. Such reports must include an assessment of anticipated impacts on wildlife.
	The responsible federal agency, in consultation with FWS, must take all necessary action to ensure that endangered or threatened species are not further jeopardized and that critical habitat of such species is not modified.
Office of Management and Budget (OMB)	No permits required.
	Appropriation requests to construct federal facilities must include appropriate allocation of funds to meet federal standards and limitations for solid waste disposal and applicable federal, state, and local standards and limitations for air, water, and noise pollution control.

Table XI-1(Continued)

FEDERAL REGULATORY REQUIREMENTS continued

AGENCY	APPROVALS/OTHER REQUIREMENTS
Office of Management and Budget (OMB)	In planning facility location, the responsible federal agency must evaluate and consider flood hazards and, to the extent practicable, avoid unnecessary use of floodplains. The appropriation request must be accompanied by a statement of the agency's flood hazard evaluation and findings.
National Marine Fisheries Service (NMFS)	No permits required. Consultation with NMFS required if modification of any waterway is planned that may affect marine life within its jurisdiction. NMFS recommendations must be incorporated into a report to Congress or to any other agency or person responsible for authorizing the project. Such reports must include an assessment of anticipated impacts on wildlife. The responsible agency, in consultation with NMFS, must take all action necessary to ensure that endangered or threatened species are not further jeopardized and that critical marine habitat of such species is not modified.
Office of Pipeline Safety (OPS)	No permits required. OPS monitors pipeline construction and inspects pipeline facilities to ensure compliance with DOT standards. If OPS determines that standards are not met, it may issue a cease and desist order.

for underground brine injection and hydrocarbon emissions; requirements for Bureau of Land Management easements for brine disposal pipelines on the Gulf of Mexico Outer Continental Shelf; approvals from the Corps of Engineers for dam and levee crossings, and dredge and fill operations; and approval of the Advisory Council on Historic Preservation and consulation with the State Historic Preservation Officers for construction on potentially significant historic sites. The risk of delay can best be minimized by close cooperation with all regulatory agencies in the design and planning of site development. In view of the short time available to satisfy ESR requirements, such cooperation and consultation are essential. Although regulatory agency personnel contacted by FEA have expressed a willingness to assist in resolving the problems that could delay the program, continued Congressional guidance may be necessary to achieve the ESR mandate.

Environmental Plan

The third component of the environmental review and planning process is the Environmental Plan. Its purpose is to guide the examination and resolution of specific environmental problems identified at each site and to implement the FEA's policy of environmental protection and impact mitigation. In so doing, the plan will link the findings of the EISs to the decision-making process, thereby giving environmental issues the same degree of attention as engineering and economic issues.

For each generic and site-specific environmental problem identified in the EISs and summarized in the following section of this chapter, the Environmental Plan will contain the following elements: a goal for environmental protection, actions to achieve the goal, economic costs and environmental benefits resulting from such actions, and program responsibility for plan implementation.

FEA is establishing an environmental-protection goal for each potentially adverse impact--for example, the maximum level of hydrocarbons to be emitted to the atmosphere during cavity fill and withdrawal. These goals will comply with applicable Federal standards and regulations. Where there are no standards, FEA will attempt to maximize protection of the environment within the constraint of timely and economic achievement of the storage goals set by Congress.

Actions to achieve the goals will pertain to facility siting and design, construction procedures, community assistance requirements, contingency plans for responding to accidents, and procedures for fill and withdrawal. A program of environmental monitoring will also comprise an element of the plan.

Actions for facility siting, design, construction, and operation will take the form of performance criteria that specify environmental conditions not to be exceeded. Possible methods for meeting the criteria will be described. For example, a criterion might be set for the amount of erosion at a site during construction activities. Methods suggested for avoiding high levels of erosion might include covering susceptible areas on a site with mulch, hay, or gravel.

Requirements for community assistance, such as temporary housing or transportation for construction workers, have also been identified in the EISs. Actions to provide these services will be detailed in the socioeconomic portion of the Environmental Plan. They will include steps to be taken by FEA in conjunction with other Federal, State, or local agencies, as well as a description of the coordination required with these agencies or private groups.

The Environmental Plan will also specify procedures for responding to accidents, natural disasters, and contingencies. For example, it will establish a contingency plan containing procedures to reduce oil spillage and facilitate clean-up operations. Locations of sensitive environments potentially in the pathway of spills will be identified in advance so that immediate protective measures can be undertaken. Similar procedures will be developed for responding to other accidents or natural disasters such as brine spills, floods, and fires.

Finally, monitoring programs will be implemented for those occurrences which have very remote risks associated with them, but which could result in very damaging impacts (e.g., cavity collapse, pipeline accidents, storage tank settling). The monitoring programs will provide early detection of these occurrences, thereby allowing the maximum possible mitigation of their effects. These programs will note the factors to be monitored, location of monitoring points, frequency of data collection, and documentation required.

In order to insure that environmental concerns are given adequate consideration during program development and implementation, responsibility for preparation of the Environmental Plan will be separate from that for facility design, construction and operation. However, since the Plan will be developed in parallel with the design of individual site facilities, close coordination between these two activities is essential. Therefore, as environmental criteria for facility design are developed, they will be incorporated into specific site plans. Environmental criteria and procedures will also be submitted to the Construction Manager to ensure that appropriate measures for protecting the environment are integrated into facility construction.

As facilities are designed and modified, the designs will be reviewed for possible conflicts with the Environmental Plan. Significant differences between the proposed design and the Environmental Plan criteria will be brought to the attention of the Change Review Board[1] for resolution by a change in the design or a modification to the Environmental Plan.

Notice of the availability of the Environmental Plan will be announced to the public in the Federal Register. Later modifications to the Environmental Plan will also be made available to the public through announcements in the Federal Register.

ENVIRONMENTAL IMPACTS OF THE PROGRAM

Generic Impacts

The conversion of solution-mined caverns in salt domes and conventional mines (in salt or other geologic formations) to crude oil storage facilities requires activities that will affect the environment in varying degrees. Conversion and storage activities and their associated impacts are summarized in Table XI-2. These activities are: (1) storage site construction; (2) disposal of brine (not required in conven-

[1]The Change Review Board has been created to establish uniform procedures for the submission, evaluation, coordination, and approval or disapproval of proposed changes to project descriptions during the detailed design, construction, conversion and operation of the Strategic Petroleum Reserve.

Table 4I-2

GENERAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH A STORAGE FACILITY IN A SOLUTION SALT DOME OR CONVENTIONAL SALT MINE

IMPACTS	GEOLOGY AND SOILS	LAND USE	WATER QUALITY AND WATER SUPPLY	AIR QUALITY	NOISE	ECOLOGY	SOCIOECONOMIC
ACTIVITIES							
STORAGE SITE CONSTRUCTION	Surface disruptions and temporary erosion during site excavation and grading involving from 15,000 to 64,000 cubic yards of material	.1-2% of surface area of salt dome on about 135 to 260 acres maximum for pumps, access roads, pipelines for a solution mined site and 50 acres for an existing mine site	Temporary increases in turbidity and levels of petroleum products, herbicides, metals and salt additives, and construction chemicals	Temporary degradation by construction vehicles, drill rig equipment, resulting in dust, hydrocarbons, SO_2, NO_x, probably not measurable beyond several hundred yards off site	Noise impact zone greater than 55 dBA at 2,000 feet from site; noise much less beyond that distance from site	Where new cavities must be created, loss and disruption of wildlife habitat at the site for up to four years; existing solution cavities will require one to two years; existing mines even less	60 to 150 non-local workers in addition to 850 to 1200 local workers with a direct expenditure of $50 to $100 million per year for a 200 MMB facility; net increase some $6 to $9 million; temporary influx of personnel with associated pressures on services, traffic, and public facilities
BRINE DISPOSAL (SOLUTION MINES ONLY)	Generally slight, impacts though rock fracture possible if extreme pressure builds up during underground disposal in later cycles	For solution domes acreage loss for brine storage tanks or ponds having a volume equivalent to the oil in storage; little impact associated with salt mines; 25 to 130 acres involved in ESR	For constructing 200 MMB site, 33,000 gpm fresh water and 36,000 gpm sea water required over 42-month period; 41,000 gpm saturated brine would be produced; brine disposal by underground well, offshore pipeline or reuse by industry; salinity increase offshore 0.1 ppt over 250-450 acres; no increase more than 3.5 ppt	Slight temporary impact during drilling and construction operations	95-100 dBA at 50 feet; noise impact zone at 1800 feet	Possible disruption of benthic habitat in vicinity of outfall during brine disposal for 41-month construction period of 200 MMB solution mined facility	No impact
MARINE RELATED FACILITY CONSTRUCTION	Excavation of 35,000 to 1,000,000 cubic yards of material at several sites for slips, docks and support structures with resultant erosion	Varying loss of zero up to 250 acres for facilities	Temporary increases in BOD, decreases in DO, reduction of pH, increases in nutrients, heavy metals, suspended solids, turbidity, toxic sulfides, pesticides, TKN, COD, depending on the site	Increased dust, SO_2, NO_x, paint solvent emissions	70 dBA at 500 feet from pile drivers, impact zone at 2,000 feet	Temporary disruption of benthic habitat; up to 25 acres marsh habitat lost	25 to 100 workers and up to $1.2 million depending on facility requirements
PIPELINES	Temporary disruption of soils by excavation and refilling pipeline trenches	Loss of 55 to 1,200 acres for rights-of-way along 1 to 90 miles pipeline routes	Possible decrease in pH, DO, and increase in nutrient content and BOD associated with dredging for pipelines at river crossings	Slight hydrocarbon emissions	Noise impact zone at 500 feet	Disruption and loss of some wildlife habitat along rights-of-way, but vegetation would return; temporary disruption of wildlife and soil organisms (on land) and non-mobile benthic organisms (in water) if spills occur	Less operation expense than barges; maximum employment of 150 persons for a year to place 80 mile pipeline; minimum employment 50 people for shorter pipelines

Table XI-2 (Continued)

GENERAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH A STORAGE FACILITY IN A SOLUTION SALT DOME OR CONVENTIONAL SALT MINE continued

	GEOLOGY AND SOILS	LAND USE	WATER QUALITY AND WATER SUPPLY	AIR QUALITY	NOISE	ECOLOGY	SOCIOECONOMIC
OIL DISPLACEMENT	Temporary and minor surface disruption during placement of pipelines on land	Loss of 1 to 15 acres of land for pumping stations and pipeline rights-of-way	For a large 200 MMB site, 40,500 gpm fresh water or 39,300 gpm sea water over 150-day period; for a 90 MMB site, 18,200 gpm fresh water or 17,700 gpm sea water necessary from rivers, reservoirs, or ground water; no displacement water required in existing mines because pumps are used	Slight hydrocarbon emissions	Noise impact zone up to 500 feet	Plankton affected during withdrawal phase at water source intake due to entrainment of low mobility organisms; benthic habitat along pipeline corridor temporarily destroyed	Approximately 50 employees required during construction of pipelines
MARINE OPERATIONS	Some erosion of channel banks from barge, tanker and lighter traffic	No impact	Increased barge and tanker traffic over 28-month fill period and 5 to 9-month withdrawal period depending on site; expected total spill for fill/withdrawal cycle for tanker traffic 273- to 536-bbls and 1,827- to 7,857-bbls for barges; for spill of 5,500 bbls, spill could cover 3,850 acres of surface water if uncontained	Hydrocarbon emissions range from 781 lbs/day unloading a 5,000 bbl barge to 70,500 lbs/day loading a 254,000 bbl tanker; at several sites HC emission would exceed EPA standard of 160 $\mu gms/m^3$	Loading and unloading vessels and barge traffic yield 55 dBA at 500 feet	Destruction of non-mobile species and residual oily taste in fish from spill; spill affecting marsh could cause loss of productivity for 2 years	Increase in demand for barges, tug boats, crews, with resultant increase in regional employment and income; possible impact to recreational use of water from oil spill; significant clean-up costs
FACILITY OPERATIONS	No impact	No impact	Small quantities of solid and sanitary waste, usually disposed of on-site; no adverse impact	At sites where tankage is required, a single 400,000 bbl tank would emit about 229 lbs/day or 1.20 g/sec hydrocarbons	Noise impact zone at 200 feet	No additional impact	Crew of 3 to 10 during storage phase, 20 to 50 during fill/withdrawal phase

Sources: Programmatic Environmental Impact Statement and Site Specific Environmental Impact Statements

tional mines); (3) marine-related facility construction, including tanker terminals, barge docks, enlargement of slips, and emplacement of ballast tanks; (4) pipeline construction; (5) oil fill and withdrawal; and (6) marine operations involving the transport of oil to and from the facility.

The environmental impacts of four of these activities , i.e., storage site construction, pipeline construction, oil displacement, and facility operations are common to virtually all sites and are generally short term and susceptible to mitigation. Storage site construction would require only one to two percent of the surface area of the salt domes, or 135 to 260 acres for each dome. Site excavation and grading would increase dust levels and soil erosion and operation of construction vehicles would produce small quantities of hydrocarbons and other pollutants. Disposal of construction-related waste and fill materials would also be required. Construction activities could disrupt wildlife habitats, and fill-withdrawal activities might temporarily displace some wildlife.

Pipelines constructed for the transport of oil, brine, or water could range in length from 0.5 mile to 80 miles. Excavation required for pipeline construction and backfilling would temporarily disrupt soils. Where river crossings are necessary, dredging would cause local and temporary increases in turbidity and concentrations of dissolved nutrients, biochemical oxygen demand (BOD), toxic sulfides and hydrocarbon compounds. Habitats along 50- to 100-foot rights-of-way would be disrupted during pipeline construction, but these temporary adverse effects would be mitigated somewhat by revegetation. In addition, the open area along the pipeline would provide an environment in which a diversity of species could thrive.

During withdrawal, oil in solution-mined caverns would be displaced by pumping freshwater, seawater, or brine into the cavities. For a large, 200 MMB site, approximately 40,000 gallons per minute (gpm) of water would be pumped over a 150-day period; for a 90 MMB site, about 18,000 gpm of water would be needed. Displacement water would be obtained from rivers, reservoirs, the Gulf of Mexico, or other surface water sources. While the amounts of water required for displacement are significant, sufficient water is available for this purpose from existing water bodies.

Operation of the facilities would have virtually no impacts, either beneficial or adverse. A crew of three to ten people would be employed during storage and 20 to 50 during the fill/withdrawal phases, depending on the size and requirements of each site. Small aboveground surge tanks at each site would emit hydrocarbons, even during inactive storage periods. For example, the largest surge tank under consideration, 400,000 barrels, would emit about 120 pounds of hydrocarbons per day.

These impacts would also arise, in varying degrees, in connection with developing the longer range SPR sites, and, in nearly all cases, would either be the same as those for an ESR site or would be more severe, roughly in proportion to the increased capacity of the SPR sites. For example, the impacts of pipeline construction are largely independent of facility capacity, and are controlled by such factors as pipeline length, terrain, and construction methods. On the other hand, impacts of site construction activities and oil transport and transfer operations (e.g., evaporative hydrocarbon emissions and oil spills) increase in proportion to the amount of stored oil, and thus would be proportionately larger for sites with larger capacities.

While the impacts of storage site construction, pipeline construction, oil displacement and facility operations are generally short term and susceptible to mitigation, several of the other activities cause more severe impacts. These environmental considerations include hydrocarbon emissions from transfer activities, impacts of brine disposal, impacts of dredging, and the more remote risks of cavity collapse and oil spills. Therefore, the remainder of the section on generic impacts will focus on:

- Hydrocarbon emissions
- Brine disposal
- Dredging
- Other risks

Each activity or impact will be described in terms of effect, importance, and mitigation. The following discussion makes

these generic impacts specific to individual ESR candidate sites.

Hydrocarbon Emissions

During the transfer of oil between the storage cavern and barges and tankers, hydrocarbon evaporation would occur. Not all hydrocarbon emissions are hazardous, nor do they all contribute to photochemical oxidant formation (smog). Further, there are no reliable measurements of hydrocarbons emitted as a result of oil transfer activities, since these emissions vary with the size of the vessel, pumping capacity and oil handling practices at individual docks. However, using standard FEA emission factors for gasoline, it has been estimated that the hydrocarbon emissions from vessel loading and unloading would range from a low of 781 pounds per day for unloading a 5,000-barrel barge to 70,500 pounds per day for loading a 254,000 barrel tanker. These estimates somewhat overstate the impacts because gasoline is more volatile than crude oil. Nevertheless, they indicate that at several sites, under worst-case atmospheric conditions, hydrocarbon concentrations would exceed the Federal three-hour standard (i.e., 160 ug/m^3) for distances of 0.5 to 45 miles downwind. The effects of these emissions could be mitigated if vessel unloading was restricted to periods of good atmospheric conditions. However, use of this practice would depend upon the requirements of the fill schedule for a particular site.

With certain exceptions, dispersal conditions in the Texas and Louisiana Gulf Coast region are good. The use of vapor flaring and vapor recovery systems at some of the storage sites during the fill-withdrawal phases could lower hydrocarbon emissions.

Brine Disposal

When developing a new cavern or modifying an existing cavern in a solution-mined salt dome, water is first injected into the dome through a well and this water is then circulated inside the cavity to dissolve the salt. This process is referred to as leaching. As the water becomes saturated with dissolved salt, it is displaced from the cavern by incoming water. The cavern configuration is controlled by proven solution mining techniques.

Where existing cavities are used for storage, a typical facility would produce about 18,000 gpm of brine for disposal during initial fill and each subsequent fill (assuming a 150-day schedule). The plans for the development of the SPR sites contemplate solution mining new cavities, as well as converting existing ones. Where new storage caverns must be leached, it is estimated that up to 33,000 gpm of freshwater, or 36,000 gpm of seawater would be needed over a 42-month period for a 200-million barrel facility.

When a solution-mined cavity is used for storage, the brine must be disposed of using one, or a combination of the following methods: (1) use by local industry; (2) deep-well injection; or, (3) transportation by pipeline to the Gulf of Mexico. Although use by industry is environmentally the most desirable of the three options, its application is limited because of the small number of potential industrial users and the relatively small quantities used by them. Where large volumes of brine are produced by storage in large cavities or the solution-mining of new cavities, or where no local industry is available to use the brine, deepwell injection or disposal in the Gulf of Mexico would be required.

Deep-well injection refers to placing the brine, generally under pressure, in permeable strata (aquifer) 3000 to 8000 feet deep within the subsurface beneath a confining layer(s) that isolates the injected fluid from potable water supplies and other elements of the biosphere. Injection of the nearly saturated brine increases the salinity and dissolved solid content of the strata (aquifer) to which it is injected. Because of the depth of the receiving aquifer, the risk of contamination of shallower, freshwater aquifers is remote and would occur only if operating conditions were substandard or uncontrolled. Possible adverse effects of substandard or uncontrolled brine injection include: (a) displacement of saline water to freshwater zones located at some distance from the well; (b) fracturing of rock strata separating fresh and saline ground waters (aquicludes); (c) migration of the brine or saline formation fluids along or through existing or created fractures or faults; (d) upward transfer of brine along deteriorated well casings; (e) interconnection of low-pressure fresh, or nearly fresh, groundwaters via unplugged or poorly plugged abandoned wells that penetrate both zones of permeability; and (f) more unlikely, gross readjustment of surrounding strata (e.g., activation of faults in

underpressured zones where frictional resistance is overcome by hydrostatic pressures).

Of all these possibilities, the risk of encountering old, perhaps unknown, wells that are not sufficiently plugged is probably the greatest. Therefore, injection zones are usually placed at relatively great depths, because very old wells are usually relatively shallow. The Environmental Plan will consider all other possible consequences of brine injection by including measures to: (a) ensure careful evaluation of aquifer capacity and pressure gradients to avoid wellhead blowouts; (b) use conservative spacing of injection wells to avoid fracture and contamination of fresh water aquifers; and (c) install secure wellhead plugs on all abandoned wells in the area of influence.

Brine disposal in the Gulf of Mexico would require transporting brine several miles offshore through pipelines, and dispersing the brine into the seawater. This method of brine disposal would increase salinity near the point of discharge, which, in turn, would adversely impact the aquatic community for the duration of the discharge. Analysis of the effects of brine disposal in the Gulf, under assumptions of worst-case conditions (i.e., simultaneously developing caverns for a 200 MMB storage facility) indicates that a change in salinity that could affect aquatic life would occur between 450 feet and 11,000 feet downcurrent of the brine diffuser, depending on the ocean currents. The area experiencing an increase in salinity of 0.5 parts per thousand would cover an area no greater than 3000 acres, also depending on the currents. A study of marine life tolerance and response to changes in salinity concluded that brine disposal into the Gulf would not create a hazard to marine life. In addition, if brine were disposed of far enough from the shoreline to prevent detectable salinity changes from encroaching upon known reefs, banks, or important fishing areas, or impeding marine ingress or egress at tidal inlets, temporary impacts would be further diminished.

Dredging

Marine-related activities such as enlarging or constructing barge slips and tanker terminals, creating new channels or altering existing channels, and maintaining the marine facilities after construction and installing pipelines at river crossings would require fairly extensive dredging. Approximately 35,000 to 1,000,000 cubic yards of material might have to be excavated at each site depending on the requirements of the individual facility. During excavation, a mechanical or

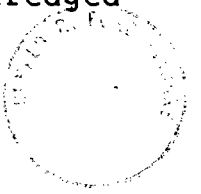
hydraulic dredge is used to increase water depth by removing bottom material.

Dredging activities can disturb or destroy non-mobile bottom dwelling organisms. Not only does dredging remove the substrata upon which these organisms depend, but the resuspension of silt can increase turbidity in the vicinity of the dredging operation to a point where a significant reduction in light penetration would decrease photosynthesis. The settling of the suspended sediments could also bury highly productive grass flats or oyster reefs. The resuspension of silt and the redisposition of the suspended sediments (including physical, chemical, and biological pollutants) can be particularly dangerous if bottom deposits contain unusually high levels of pesticides or other organics, radionuclides, or heavy metals. Other adverse impacts would occur if the bottom materials contain large quantities of unoxidized or partially oxidized organic material or where deposits contain high levels of petroleum or petro-chemical derivatives, or nutrients.

In the vicinity of the dredging activity, turbidity would increase as a result of the turbulence created by the dredge. In a river that has strong currents, the turbidity plume could extend from a distance of 200 feet to one mile. It is difficult to predict the downstream pollution that would result from this turbidity plume because of the absence of water quality data for the rivers adjacent to the storage sites. However, most researchers have concluded that use of modern dredging techniques would minimize the effect on the quality of the water. The area of impact is usually not more than 200 feet downstream of the dredging activity, even when the sediments are highly polluted.

Intracoastal waterways traverse estuarine areas characterized by extensive salt marshes. Dredged material (spoil) from these environments is, in most cases, deposited in spoil banks on the salt marshes. Transporting dredged material to more remote disposal sites would be costly.

Adverse impacts of spoil disposal include increased turbidity in the disposal area; a significant release of aquatic nutrients; lowered dissolved oxygen levels; release of toxic sulfides; release of toxic heavy metals or arsenic; and release of pesticides or other toxic hydrocarbons mixed in the bottom sediments. If the bottom materials being removed had no commercial value they could be used for fill and redeposited on salt-marsh lands. However, the productivity of the marsh lands could be destroyed, so selection of disposal sites will require careful evaluation. Also, during disposal of dredged



material on undiked salt marshes, it is possible that some chemical constituents of the dredged sediment may be released in the runoff water of the spoil bank. This contaminated runoff could lower surrounding water quality. However, by utilizing the most recent dredging technology and procedures, dredge material disposal impacts can be localized and minimized. In addition, as part of the Environmental Plan, the feasibility of construction dikes to contain runoff, and using previously created spoil banks for disposal would be evaluated for each site.

Other Risks

Accidents that might occur as a result of the activities taking place during the fill-withdrawal phases of the storage program include cavity collapse and oil spills. During withdrawal of stored crude from caverns in leached salt domes, there is some risk of cavity collapse. Oil spills might occur during transfer by marine vessels and through pipelines, as well as during vessel loading and unloading operations. These risks are discussed below.

Cavity Collapse

Historically, rare cavity collapses in solution-mined salt domes have been caused by uncontrolled leaching adjacent to the caprock, and subsequent subsidence of the unsupported overburden. Because of a few instances of salt dome cavity collapse in the Gulf coastal region, a special investigation was undertaken to assess the safety of oil storage in underground solution-mined cavities. Study results indicated that the risk of such collapse is extremely low.

The inherent characteristics of solution-mined caverns contribute to their suitability for crude oil storage. For example, at the temperatures and pressures in which the crude would be stored, the plasticity of the salt would allow the caverns to withstand shocks far in excess of any earthquake known to have occurred in the Gulf Coast region. In addition, in a solution-mined cavity, brine used to displace oil during the withdrawal phase would be retained in the cavity to maintain structural stability. In the case of conventional mines, the room and pillar method of mining ensures cavern integrity. The technique provides support pillars,

which occur at regular and relatively close intervals throughout the mine.

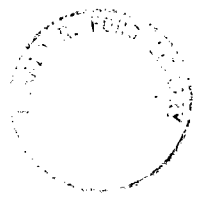
For solution mines, during each fill and withdrawal cycle, salt dissolution would result in cavity growth of approximately 15 percent. Upward cavity growth can be controlled by maintaining a blanket of oil near the cavity ceiling. Cavity growth in all directions can be controlled by using saturated brine, rather than freshwater, as the displacement fluid. The location of the oil-brine interface can be monitored by any of several available methods, such as sonic interface detection, nuclear logging, and oil column pressure gauging. Thus, the level of the oil-brine interface can be controlled to preclude any undesirable upward leaching. The physical arrangement of the well casings prohibits withdrawal of oil from the area above the location of the opening. Thus, an oil blanket would always be present in any leached space above the opening. These built-in mechanisms in the system would provide a fail-safe design, to prevent cavity collapse, which is not subject to operator error.

Further, where storage involves cavity construction by solution-mining, special procedures would be instituted for each site as part of the Environmental Plan to offset the already low risk of cavity collapse.

Oil Spills

Because barge and tanker traffic would have to increase during fill-withdrawal phases to handle the large volume of oil to be stored, the potential for oil spills would also increase. Actual spill sizes would depend on many factors, including the amount of oil handled, methods of handling, types of transport, and location. For example, potential spill loss is higher for transport than for handling, and higher for combined tanker and lighter unloading than lighter loading alone.

An analysis of the past history of oil spills shows that, under worst-case assumptions, about six accidents resulting in spills are predicted to occur during the fill phase of the program. The assumption included a total transport cycle from the Middle East to crude oil terminals in the Gulf Coast via relatively small tankers (less than 50,000 DWT). The most likely type of accident are grounding and structural failures, and they also have the largest predicted mean spill size (approximately 10,000 barrels). Use of



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