. . . . Emergency Preparedness for Interruption of Petroleum Imports into the United States. . . . July 1973

An Interim Report of the National Petroleum Council

National Petroleum Council
(Established by the Secretary of the Interior)

July 24, 1973

My dear Mr. Secretary:

I am pleased to transmit to you the Interim Report of the National Petroleum Council entitled, *Emergency Preparedness for Interruption of Petroleum Imports into the United States*.

The objective of this study is to assess the capabilities of the United States to cope with a sudden but temporary interruption of petroleum imports into this country and to review the options open to us to minimize the impact of such an interruption. It should be carefully noted that this is fundamentally a different condition from the current tight petroleum supply situation which exists domestically.

Ultimately, the best way to minimize the impact of a disruption of imports is to develop our domestic energy resources to the maximum extent possible. It is important to recognize that the United States has extensive primary energy resources which can be developed. This requires the cooperation of all responsible people.

The purpose of this Interim Report is to present only the preliminary findings of the Committee on Emergency Preparedness. This is submitted at this time per your earlier request. The Committee's study and the NPC's final report will not be completed for several months. Hopefully, the preliminary findings of this report will assist both government and industry in its initial efforts to formulate emergency preparedness plans for the type of contingency hereby assessed. Additional and more detailed results will be presented in the final report.

Respectfully submitted,

H. A. True, Jr., Chairman

Honorable Rogers C. B. Morton
Secretary of the Interior
Washington, D. C.

. . . . Emergency Preparedness for Interruption of Petroleum Imports into the United States. . . . July 1973

An Interim Report of the National Petroleum Council

. . . . . . Prepared by the National Petroleum Council's Committee on Emergency Preparedness . . . . Carrol M. Bennett, Chairman . . . . with the Assistance of the Coordinating Subcommittee . . . . James S. Cross, Chairman. . . . .

NATIONAL PETROLEUM COUNCIL

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Industry Advisory Council to the

U.S. DEPARTMENT OF THE INTERIOR

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INTRODUCTION

The objective of the National Petroleum Council's Emergency Preparedness Committee is to assess the capabilities of the United States to cope with a sudden but temporary denial of petroleum imports and to review the options open to the country to minimize the impact of such an interruption. The type of emergency postulated in this report would result from a short-term, 90- to 180-day, denial of 25 to 50 percent of the Nation's waterborne petroleum imports. This denial could occur with little warning as could result from actions over which the United States has no direct control or from confrontations of foreign governments which do not involve armed conflict by the United States. Ultimately, however, the only effective protection against an import interruption is to develop to the maximum extent possible the Nation's domestic energy resources. In recent times, the Nation has not provided adequate encouragement for the development of these resources.

Until recently, the United States has been essentially self-sufficient in its petroleum needs. Prior to early 1972, spare domestic crude producing capacity was available and could be called upon to meet the growing needs of the U.S. economy. Since 1972, however, domestic crude production has been at capacity and is now entering a declining production trend.

The United States has an adequate energy resource base which can be converted into available supplies given sufficient time and a political and economic environment which encourages development. The National Petroleum Council's U.S. Energy Outlook report examined the long-term requirements for energy in the United States, analyzing both the possibilities of meeting these needs with domestic fuels and the changes in government policies and economic conditions that would be required to improve the domestic energy supply situation.*

In the short and intermediate term, however, the United States has no apparent alternative except to become increasingly dependent upon foreign oil. In 1974, the country will be importing about 42 percent of its oil needs, and by 1978 imports are projected to be 59 percent of requirements. Most of these additional imports will come from the Middle East.

The substantial dependence of the United States on imports has major national security implications. Recognizing these implications and the need for an effective emergency preparedness plan, the Secretary of the Interior early this year requested the National Petroleum Council to undertake a "comprehensive study and analysis of possible emergency supplements to or alternatives for

*NPC, *U.S. Energy Outlook--A report by the National Petroleum Council's Committee on U.S. Energy Outlook* (December 1972).

imported oil, natural gas liquids and products in the event of interruptions to current levels of imports of these energy supplies" (see request letters, Appendix A). The Secretary further requested that the study assume import interruptions of 1.5 and 3.0 million barrels per day for 90-day and 180-day periods. In the request letters, it was pointed out that, in a period of rapidly increasing dependence on imported petroleum, "it becomes mandatory that the Nation's emergency preparedness program to ensure supply of petroleum be improved without delay."

A distinction must be drawn between the current tight domestic petroleum supply situation and the emergency conditions which are addressed in this report. Difficult supply conditions in this country result from trends which have been established over a period of years, and it is expected that these trends will persist during the next several years. This study, on the other hand, concerns itself with a sudden interruption of imports which is of limited duration (3 to 6 months).

The solutions available to minimize the impact of a short-duration imports interruption are fundamentally different from those required to correct the long-term domestic supply situation. In the event of a short-term interruption of the magnitude specified by the Secretary of the Interior, it would be extremely difficult for the economy to readjust itself without resorting to emergency measures. Measures which are applicable for short periods of time include substantial reductions in demand, emergency production measures, reliance on crude and products which have been stockpiled, and maximum utilization of available alternate energy sources. Obviously these emergency measures can only be maintained for weeks or months rather than years. Thus, solutions to the long-term supply shortages lie in providing a free marketplace and an economic and regulatory climate which encourages maximum energy self-sufficiency rather than in temporary emergency measures. Accordingly, the Secretary of the Interior requested that particular attention be given to--

> ...the capability for emergency increases in production, processing, transportation and related storage; the ability to provide and maintain an emergency storage capability and inventories; interfuel substitution or convertibility of primary fuels in the major fuel consuming sectors; side effects of abnormal emergency operations; gains in supply from varying levels of curtailments, rationing and conservation measures; gains from temporary relaxation of environmental restrictions; as well as the constraints, if any, imposed by deficient support capability if an extraordinary demand occurs for manpower, materials, associated capital requirements and operating expenses due to emergency measures.*

In response to these requests, the National Petroleum Council established a Committee on Emergency Preparedness under the chair-

*Request letter, Appendix A.

manship of Carrol M. Bennett, Chairman of the Board, Texas Pacific Oil Company, Inc., and the cochairmanship of Hon. Stephen A. Wakefield, Assistant Secretary of the Interior for Energy and Minerals. The Committee is assisted by a Coordinating Subcommittee, chaired by Dr. James S. Cross, Director, Economics and Industry Affairs, Sun Oil Company, and the cochairmanship of Duke R. Ligon, Director, Office of Oil and Gas, Department of the Interior. (For a listing of members of the Committee and its Subcommittees, see Appendix B.)

The purpose of this Interim Report is to present the preliminary findings of the Committee. Although the Committee's study and final report will not be completed for several months, it is believed that these preliminary findings will aid both industry and government in their current efforts to formulate emergency preparedness plans. Again, it should be emphasized that these are preliminary findings and that additional and more detailed results will be presented in the final report.

BASES FOR THE STUDY

In order to develop and quantify the emergency preparedness options available to respond to the imports disruptions outlined in the Secretary's request letter, the Committee decided to consider the cases shown in Table 1.

TABLE 1

IMPORT INTERRUPTION CASES CONSIDERED

Date of Interruption	Volume (MMB/D*)	Period of Interruption (Days)	Type of Import
1/1/74	1.5	90	Crude
			60/40 Crude/Product
	3.0	180	Crude
			60/40 Crude/Product
1/1/78	3.0	180	Crude
			60/40 Crude/Product

* Million barrels per day.

The Committee adopted Case IV from the NPC U.S. Energy Outlook report for the pre-denial petroleum supply/demand balance situation on January 1, 1974, and January 1, 1978. Case IV is essentially a "trends continue" case and, in view of recent experience, was considered appropriate for the purposes of this study. However, a pre-denial supply/demand situation is not critical to the results of this study since the interrupted volumes have been specified by the Department of the Interior in its study request.

The Committee also selected for use in its various economic and cost anlayses the oil and gas "price" projections of Case IV recalculated in constant 1973 dollars.* Costs and economics were calculated in constant 1973 dollars in order to eliminate uncertainties associated with projections of inflation.

In further developing the base case, the Committee recognized recent oil supply and demand trends by minor adjustments to the

*Costs and "prices" used in the U.S. Energy Outlook report were calculated in constant 1970 dollars to eliminate all future inflationary effects. As used in the U.S. Energy Outlook study, "price" does not mean a specific selling price as between producer and purchaser and does not represent a future market value. The term "price" is used to refer generally to economic levels which would, on the bases of the cases analyzed, support given levels of activity for the particular fuel.

1974 balance projected by Case IV of the U.S. Energy Outlook report. Thus, for the purposes of this study, the overall oil supply/demand picture, against which the impact of import denials will be evaluated, is shown in Table 2.

It is quite clear that the United States, between now and 1978 (the time period under consideration in this study), will have to rely on imports of crude oil and products for a substantial part of its energy needs. With imports projected to reach 13.5 million barrels per day in 1978, a disruption exceeding the 3.0 million barrels per day addressed in this study is entirely possible.

TABLE 2

TOTAL U.S. PETROLEUM SUPPLY/DEMAND BALANCE*
(Million Barrels per Day)

	Actual	Projected	
	1970	1974	1978
Total Demand	14.7	18.3	22.7
Domestic Liquids Production			
Crude and Condensate	9.6	9.0	7.8
Natural Gas Liquids	1.7	1.6	1.4
Total	**11.3**	**10.6**	**9.2**
Imports			
Overland	0.8	1.2	1.2
Waterborne	2.6	6.5	12.3
Total	**3.4**	**7.7**	**13.5**
Imports as Percent of Demand	23	42	59

* Based on Case IV of the U.S Energy Outlook report with minor adjustments to 1974 data to reflect current conditions.

PRELIMINARY FINDINGS AND CONCLUSIONS

The National Petroleum Council was requested by the Department of the Interior in early 1973 to make a comprehensive study and analysis of possible emergency supplements to or alternatives for imported oil, natural gas liquids and petroleum products in the event of an interruption of these imports. At the outset, it was recognized that completion of this study would require about 1 year; however, the Secretary of the Interior requested that the NPC present on Interim Report of its findings in July 1973.

This Interim Report represents a summary of the findings of the Emergency Preparedness Committee to date. Areas of study for which significant findings can be reported include evaluations of savings through petroleum use curtailment which might be realized through voluntary and mandatory measures, estimates of emergency oil production volumes, and evaluations of the feasibility and cost of providing emergency standby petroleum supplies by storage or by restriction of domestic production. Substantial additional work remains to be undertaken in the areas of fuel convertibility, logistics and the detailed requirements of an emergency preparedness plan.

In order to respond adequately to the Secretary's request, the Committee concluded that it would be necessary to analyze the impact of an emergency under two basic conditions. The first condition is one in which the United States has only minimal opportunity to develop emergency preparedness plans and take positive steps, such as establishing emergency petroleum supplies to minimize the impact of an imports interruption. This condition is represented by an interruption occurring on January 1, 1974, when it will be necessary to rely almost completely on existing administrative systems and physical facilities. The second condition is one in which the Nation has sufficient time to develop emergency plans and take positive steps to offset an interruption. A date of January 1, 1978, was selected by the Committee as the earliest time by which significant protective measures could be placed into effect.*

Again, it should be emphasized that the objectives and findings of this study are oriented toward an emergency resulting from a sudden and limited (3- to 6-month) interruption of imports. This is a fundamentally different condition from the current tight petroleum supply situation which exists domestically. Many of the steps which can be taken to minimize the impact of a short-term interruption, such as temporary curtailments, emergency production

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*This study assumes that oil from the North Slope of Alaska will not be available by 1978; however, this assumption does not effect the results of the study since the projected level of imports in 1978 greatly exceeds anticipated volumes from Alaska.

and storage, are not applicable to the long-term problems of a growing discrepancy between domestic energy consumption and production.

Ultimately, the best way to minimize the impact of an imports interruption is to develop domestic energy resources to the maximum possible extent. It is important to recognize that the United States has vast energy resources which can be developed given the proper economic and regulatory climate. Their development will, however, require very large capital expenditures and lead times of 5 to 10 years before any substantial results can be realized. Because of these long lead times, it is imperative that positive steps be taken now to ensure the future availability of these reserves.

Specific policy recommendations to encourage domestic resource development were presented in the U.S. Energy Outlook report. These include the development of a coordinated domestic energy policy, free market pricing of oil and gas, the establishment of realistic environmental standards, the encouragement of energy resource development on public lands (both onshore and offshore), and expanded energy research. Tentative steps have been taken to implement some of these recommended actions. Conflicts with other national goals have prevented adoption of any of the more critical recommendations. Unless greater priority is placed upon the domestic energy development, the result will be continued delays which will contribute substantially to domestic supply shortages and will increase the Nation's vulnerability to an imports interruption.

Even if immediate and dramatic steps are taken to encourage domestic resource development, this remains a long-term solution. Thus, the Nation faces a continued substantial dependence on imports for the immediate future, indicating a need for the emergency preparedness measures discussed in this report.

PREPAREDNESS FOR AN EMERGENCY IN 1974

For an emergency commencing on January 1, 1974, the only options available to the United States are measures which would either reduce petroleum consumption and/or increase domestic petroleum production. Measures which include emergency storage programs could not be implemented between now and January 1, 1974.

Reduction of Petroleum Usage in 1974

Two ways of reducing petroleum usage are possible--curtailment of consumption and conversion of petroleum fueled equipment to the use of other fuels.

Curtailment of Petroleum Consumption

The curtailment of liquid petroleum consumption may be accomplished by voluntary and/or mandatory methods. The use of mandatory rationing can achieve any desired level of reduction. However, in this study the estimated curtailments are limited to levels which should not have excessive adverse effects on the economy. Curtailment of consumption on an emergency basis could reduce demand by as much as 1.6 million barrels per day in 1974.* Programs included in these reduction are--

- Gasoline reductions through car pooling, reduced highway speed limits and discouragement of recreational driving; jet fuel reductions through increasing commercial air flight load factors; distillate and residual fuel limitations through reductions of space heating and cooling; and reduced voltages and restrictions of power use for nonessential items. The potential for consumption reductions by means of these programs could range from 0.8 to 1.3 million barrels per day in 1974.

- Standby mandatory gasoline rationing programs for use in the event of larger or longer duration interruptions. These programs would include limiting the use of gasoline by consumers in contrast to programs which are currently being discussed and are designed to allocate available sources from refineries to retail outlets. They should be capable of being placed in operation within a month. Potential reductions resulting from rationing at the 10-percent level are estimated to be about 0.5 million barrels per day in 1974 without excessive adverse effects on the economy.

While these measures present a relatively high potential savings of nearly 9 percent of oil demand in 1974, the Committee recognizes that, in view of the President's recent energy conservation statement, some of these programs may have already been implemented in an effort to alleviate the current tight supply situation. To the extent this is true, the emergency potential will be reduced.

Fuel Convertibility

In 1974, the potential for savings by converting petroleum fueled equipment to other fuels will be mainly limited to those consumers which currently have a dual fuel capability. Additionally, the potential may be limited by a lack of adequate transportation and storage facilities. Thus, on the short-term interruptible basis considered in this study, current estimates indicate about 250 thousand barrels per day of oil-burning capacity could be converted to coal provided environmental restrictions do not prohibit conversion. Additional potential savings could come from existing nuclear power plants through delays in scheduled shutdowns for refuelings and through the lifting of operating restrictions on plants licensed to run at only a fraction of full capacity.

*See Section Two, Table 5

Emergency Petroleum Production in 1974

There are two means of providing incremental petroleum production in a 1974 emergency: (1) production of existing reserves at rates in excess of their legally established maximum efficient rates (MER) and (2) production of the now shut-in Naval Petroleum Reserves. (Emergency storage plans could not be implemented for an emergency in 1974.) The emergency production volumes from these potential sources are summarized in Table 3. These additional production levels require gas flaring and cannot be sustained for any significant period beyond 180 days due to the natural behavior of the reservoirs. Additionally, these volumes are based on the following assumptions:

- That temporary emergency production above legally established maximum efficient rates would be allowed
- That emergency preparedness plans which define allowable rates of emergency production would be developed by the affected states prior to an emergency
- That requisite field facilities modifications and expenditures are made
- That action is taken by the Federal Government to permit the production of petroleum reserves underlying the Naval Petroleum Reserve (NPR) No. 1 located at Elk Hills, California; a joint resolution of Congress would be required.

TABLE 3

DELIVERABLE EMERGENCY CRUDE OIL PRODUCTION CAPACITY
(Beginning January 1, 1974)

	Emergency Duration (Thousand Barrels per Day—Average)	
	90 Days	180 Days
Temporary Capacity in Excess of Maximum Efficient Rate	279	307
Naval Petroleum Reserves	13	24
Total	**292**	**331**

PREPAREDNESS FOR AN EMERGENCY IN 1978

If petroleum imports to the United States were interrupted in 1978, the Nation would likely find itself in the same situation as it is in today unless planning is started immediately by both industry and government. There is, however, sufficient time between now and 1978 for the country to become better prepared.

Reduction in Petroleum Usage in 1978

Curtailment of Petroleum Consumption

No curtailment measures are expected to be available in 1978 that are not available in 1974. Because of the larger demand base in 1978, reductions through such measures as have been discussed pertaining to a 1974 emergency could reach 2.0 million barrels per day. If a mandatory gasoline rationing system were not implemented, the maximum potential reduction would be 1.6 million barrels per day.

The Committee feels, however, that some of these measures may no longer be available for emergency planning purposes because they will be used as energy conservation measures in the interim.

Fuel Convertibility

The potential for fuel convertibility in 1978 could be significant. New oil or gas fueled power plants and industrial boilers could be equipped to burn coal in an emergency, and existing equipment could be modified to use more than one type of fuel. The Committee will attempt to quantify this potential in its final report but recognizes that, unless environmental problems regarding the use of coal are resolved by 1978, restrictions against its use must be removed in an emergency for any but limited convertibility to be realized.

Emergency Petroleum Production in 1978

As with convertibility, potential volumes of emergency petroleum production depend on planning and investments made prior to the emergency. Table 4 summarizes the volumes and investments involved.

TABLE 4

DELIVERABLE EMERGENCY CRUDE OIL PRODUCTION CAPACITY IN 1978

	Thousand Barrels per Day—Average (180 Days)		
	Without Preplanning or Pre-Investment	With Preplanning	Investments (Million Dollars)
Temporary Capacity in Excess of Maximum Efficient Rate	110	360	26
Naval Petroleum Reserves	23	262	94
Total	**133**	**622**	**120**

While industry revenue from the higher emergency production volumes would help defray the cost of the pre-investments required, these levels of investments for standby facilities would not be made by industry under present conditions.

Additional Alternatives for Emergency Preparedness in 1978

The development of additional indigenous energy resources is the most desirable long-term approach to minimizing the effect of an import interruption. By developing and executing a national policy of efficient and sensible energy use, orderly and rational environmental improvements, and the timely development of this Nation's large domestic energy resource base, the United States will be less vulnerable to the hardships of an interruption.

Since it will not be possible to develop sufficient indigenous resources by 1978, the Committee believes it essential to provide standby petroleum supplies. Given adequate planning and lead time, there are two basic methods which can be used: (1) storage and (2) restricting domestic production until it is needed in an emergency.

Alternatives for storage of emergency petroleum supplies include: (1) aboveground storage in steel tanks or (2) underground storage in salt domes, mined caverns or abandoned mines. Alternatives for the restriction of production consist of nationwide prorationing or shutting in selected fields.

The cost of providing emergency standby petroleum supplies of 540 million barrels (3 million barrels per day for 180 days), not including the costs associated with pipelines and other facilities to move petroleum supplies to and from storage, are as follows:

- Storage: The initial construction cost of providing emergency standby petroleum supplies by steel tank storage would be between $1.7 billion and $2.8 billion. The cost of inventory based on crude storage filled over the 3-year period 1975-1978 would be at least $2.2 billion. This would mean an initial total cost for steel tank storage of between $3.9 billion and $5.0 billion.

  The construction cost of providing emergency storage by means of salt dome (underground) storage reaches a total of between $227 million and $567 million for 540 million barrels of capacity. Again, an additional $2.2 billion or more would be required to purchase the inventory. This means a total cost of between $2.4 billion and $2.7 billion for underground storage.

  To fill 540 million barrels of storage over a 3-year period would require approximately 500,000 barrels per day of crude. Removal of this volume of supply from an already tight worldwide crude market would have a significant impact upon the current short supply situation. Release of the Naval Petroleum Reserves at Elk Hills for immediate development to full capacity would provide an additional 262,000 barrels per day of crude available and help to provide needed supplies.

- Restriction of domestic production: Proration or shutting in selected fields costs 5 to 10 times as much as emergency petroleum storage in tanks or salt domes. The reason for the advantage of storage over shut-in reserves is the high delivery rate possible with fixed volume storage compared with shut-in fields. Shutting in selected fields to provide 3 million barrels per day of protection would also result in the direct reduction of domestic supplies by 3 million barrels per day and cause the shut-in of 8.8 billion barrels of recoverable reserves. The total present value cost for shutting in 8.8 billion barrels of recoverable reserves would approximate $15.6 billion. This cost excludes the cost of relocating people and equipment now receiving their livelihood from the production of 3 million barrels per day. Also, the balance of trade effects resulting from increased imports of 3 million barrels per day are excluded. Therefore, restriction of production is not recommended for further consideration as a means of providing emergency petroleum supplies.

ADMINISTRATIVE AND LEGAL CONSIDERATIONS

A review of existing emergency preparedness programs is one of the areas of study not yet complete. A preliminary analysis indicates that the administrative and legal considerations discussed in the following paragraphs are important to the development of emergency preparedness plans.

Increasing dependence on imported petroleum has created a new potential emergency situation. This new situation must be defined so that the need for emergency action can be determined and procedures developed for activating an emergency preparedness plan. The basic administrative machinery for emergency preparedness planning exists at the federal level. However, most of the existing plans relate to war conditions. Specific actions which are needed include--

- A critical review of the objectives, authority and organization of the existing emergency preparedness machinery in the light of an import interruption

- A review and reconciliation of the potential conflicts between federal and state authority in the areas of resource conservation and regulation

- Initiation of cooperative planning efforts by the Government and industry.

Elements of an Emergency Preparedness Plan for Interrupted Imports

In order to minimize the impact of an emergency interruption, it will be necessary to develop emergency preparedness plans which provide for reducing demand and increasing domestic supplies. The following items must be considered:

- Alternative methods of reducing demand must take into account the ultimate impact on the consumer and the economy. Moreover, regional differences must be considered.
- Conversion from petroleum usage to coal may involve conflict with existing legislation.
- Emergency increases in production require the establishment, in advance of interruption, of the rate and duration over which production, in excess of the MER, can be sustained. State and local regulatory agencies must be consulted, and producer equities must be considered in any such plans.
- Storage programs should be developed as part of an emergency preparedness plan. Local requirements may dictate differing regional storage needs.
- The plan should have the objective of returning--as soon as possible--to a free market environment where economic incentives are adequate to encourage additional finding and development activities and reduce consumption.
- Restriction of production by either shutting in fields or proration is not an economically feasible emergency preparedness alternative. Accordingly, the Government should consider releasing its Naval Petroleum Reserves for development. Oil and gas from these sources would reduce U.S. dependence on imports or would make additional supplies available for storage.

. . . . Progress Report of the Coordinating Subcommittee. . . . . . .

Section One

COMMITTEE ORGANIZATION AND FUNCTIONS

To implement the study requested by the Secretary of the Interior, A Committee on Emergency Preparedness was established. In addition, a Coordinating Subcommittee was organized to direct the work of Subcommittees on Emergency Petroleum Production, Fuel Convertibility and Energy Use Curtailment, and Logistics. The support of many organizations made possible a total committee structure of over 60 representatives. (For a listing of Committee and Subcommittee members see Appendix B.)

The main objectives of the three subcommittees are as follows:

<u>Emergency Oil and Gas Production Subcommittee</u>

- Estimate emergency domestic liquid petroleum and natural gas supplies which could temporarily be made available in an emergency supply situation
- Determine the feasibility and cost of providing and maintaining emergency standby oil and gas production capacity by means of proration, shutting in individual fields, or finding and developing a national reserve
- Evaluate the effectiveness and cost of maintaining Naval Petroleum Reserve capacity for use in an emergency
- Determine the technical feasibility and initial construction cost of providing emergency supplies by means of underground storage of crude oil, natural gas and petroleum products
- Make economic comparisons of these alternatives
- Outline the administrative considerations and the problem areas associated with implementing any of these plans

<u>Fuel Convertibility and Energy Use Curtailment Subcommittee</u>

- Examine the methods for curtailment of energy use and product consumption with minimum economic and social disruption
- Determine the feasibility and economics of substituting coal and gas for oil and the potential for increasing electric power supply from nuclear plants, geothermal energy, hydroelectricity and electric energy imports from Canada and Mexico in an emergency situation
- Consider the possible increased use of coal if pollution controls are relaxed

- Determine the extent to which liquid petroleum supplies can be increased by diverting supplies from non-energy usage of petroleum materials, such as for chemical feedstocks and asphalt highway construction, and consider the impacts of such diversions.

Logistics Subcommittee

- Determine the flexibility of product yield, transportation and storage flexibility within existing refining and distribution systems
- Determine the capability of pipeline, refining and storage facilities to accommodate sudden import denials
- Identify and analyze regional costs of alternative aboveground crude and product storage methods
- Identify and analyze costs of providing emergency supply availability by maintaining spare refining and transportation capacity
- Develop an economic comparison of all alternative emergency oil storage systems on a full cost basis
- Review mandatory or compulsory storage programs that are in effect in both Europe and Japan.

Section Two

ENERGY USE CURTAILMENT IN A SHORT-TERM EMERGENCY

Important considerations in assessing curtailments in energy use in an emergency include (1) the impact on the domestic economy, (2) effects on public welfare, and (3) the time required for implementation. Analysis of the economic impact of curtailments considered here has not yet been completed. However, most of the measures noted should not be excessively burdensome to the economy or to public welfare and can be quickly implemented.

Energy use curtailment activities can be broadly divided between (1) those which increase energy use efficiency and moderately reduce public comfort and convenience and (2) those which begin to have significant adverse effects on industrial production. Thus far, the Committee's efforts have been heavily oriented toward consideration of the first area. Although some analysis is in progress on assessing the curtailments of non-energy oil usage, little or no consideration has been given possible curtailment of other energy-consuming industries. In the event that necessary energy use reductions begin to significantly affect industrial production, all energy-consuming industries should be examined to determine optimal curtailment measures.

FUEL CURTAILMENT

On an emergency basis, petroleum fuel usage could possibly be reduced by about 1.2 million barrels per day to 1.6 million barrels per day in 1974 and 1.4 million barrels per day to 2.0 million barrels per day in 1978, with a combination of voluntary and mandatory fuel curtailment procedures. Rapid attainment of these reductions would depend on the ready availability of a standby gasoline rationing system that could be put into effect quickly.

Table 5 summarizes the various fuel curtailment items considered and describes the estimated fuel savings attributed to each. The underlying analyses assume reductions from normal base demand levels. However, in view of the current tight supply situation, it is possible that the curtailment measures considered will have already been applied to some degree. If base demands are lower prior to the emergency, then reduction in oil demand would be correspondingly less than indicated. Voluntary items considered would require widespread public acceptance of the need for such actions whereas mandatory programs would require extensive pre-planning.

Voluntary gasoline curtailment items include increasing car pooling, rescheduling truck deliveries to off-peak traffic hours and reducing recreational uses of gasoline. With full public compliance, this approach could potentially decrease fuel consumption by 0.9 million barrels per day in 1974 and 1.1 million barrels per day in 1978. However, based on World War II voluntary curtailment

TABLE 5

ESTIMATED AVERAGE VOLUME EFFECTS OF VARIOUS ENERGY CONSUMPTION CURTAILMENT MEASURES

(Annual Volumes—Seasonal Volumes May Vary)

Description of Fuel Curtailment Measures	Estimated Range of Compliance Levels (Percent)		Estimated Range of Reduction (Thousand Barrels per Day)			
			1974		1978	
	Low	High	Low	High	Low	High
Motor Gasoline*						
Voluntary Curtailment of Gasoline Consumption	10	20	90	180	110	220
Mandatory Rationing of Gasoline†	100	100	500	500	620	620
Mandatory Reduction of Speed Limits to 50 mph	50	80	120	200	150	240
Jet Fuel‡						
Mandatory Increase of Aircraft Load Factor from 50% to 65%	75	90	170	210	240	290
Mandatory Reduction of Airspeed and Increase of of Altitude	75	90	40	50	60	70
Diesel						
Mandatory Reduction of Speed Limits for Diesel-Powered Vehicles	50	80	10	20	20	30
Other Fuels (Expressed as Oil Equivalent)						
Voluntary Space Heating Reduction of 5°	10	20	160	310	180	350
Voluntary Space Cooling Reduction of 5°	10	20	30	60	30	70
Voluntary Reduction of Residential/ Commercial Lighting	10	20	130	260	150	300
Total with Only Voluntary Curtailment of Gasoline§			**750**	**1,270**	**930**	**1,550**
Total with Mandatory Rationing of Gasoline§			**1,160**	**1,600**	**1,440**	**1,960**

* Total motor gasoline demand for 1974 and 1978 is estimated at 7,027 and 8,541 thousand barrels per day, respectively; of these volumes, about 5,000 and 6,200 thousand barrels per day represents automotive use.

† 100-percent effectiveness by definition.

‡ Total domestic jet fuel demand for 1974 and 1978 is estimated at 989 and 1,366 thousand barrels per day, respectively.

§ Totals may not agree due to rounding.

experience, it is estimated that only 10 to 20 percent of the assessed potential reduction would be realized. Clearly, support for voluntary curtailment would require a massive public information program, widespread public conviction of the existence of a shortage, and an understanding of various gasoline conservation measures and a willingness to apply them.

Vehicle speed limit reduction to 50 mph has a gasoline conservation potential of 200 thousand barrels per day in 1974 and 240 thousand barrels per day in 1978 and could be implemented by existing law enforcement agencies. Numerous violations would be expected, and for this reason only 50 to 80 percent of the potential is indicated. Even though the mechanism for enforcement already exists, to be truly effective the public must be convinced that a shortage exists and that speed limitation is an effective manner of reducing consumption.

Jet fuel savings approximating 170 thousand barrels per day in 1974 and 240 thousand barrels per day in 1978 could be realized from increasing aircraft load factors by reducing the number of flights. Current load factor levels of 50 percent could probably be raised to about 65 percent under emergency conditions. This measure would cause some inconvenience to passengers, but should not significantly reduce overall available passenger mileage. Thus, the economic penalties to airlines should not be excessive. As in the case of motor gasoline rationing procedures, it would be prudent, if not essential, to have emergency procedures pre-established and ready for rapid implementation.

Voluntary reductions of space heating and cooling have a large potential for fuel savings. However, similar to other voluntary approaches, the expected level of compliance is quite low. However, an acceptance level of only 20 percent would generate energy savings equivalent to 370 thousand barrels per day in 1974 and 420 thousand barrels per day in 1978. The savings attributable to a 5°F heating reduction at 20-percent effectiveness (or an average of 1°F across the board) is based on annual averages. However, if the emergency spanned the winter months, the demand reduction would be two to three times greater than indicated. Similarly, the savings in air conditioning for a 5°F increase in thermostat setting could be much greater than indicated.

It has been assumed that electric energy for residential/commercial use could be reduced 130 to 150 thousand barrels per day in 1974 and 1978, respectively. These reductions would be effected by lowering voltage, introducing intermittent outages, and restricting to specific hours power use for nonessential items such as lighting for exterior advertising, show windows and decorative operation of commercial establishments.

A formal rationing system would be required to effect a major part of the gasoline demand reductions shown in Table 5. Further, to achieve maximum effectiveness in a short-term emergency, it would be necessary to have a fully operational standby system prior to emergency occurrence. Although standby rationing authority exists currently, it appears that upgrading would be necessary to permit its rapid initiation.

Administrative imposition of a surcharge on gasoline purchases as a means of curtailing consumption has been studied and debated over the years. However, historical data do not cover a range of price/demand relationships adequate to permit firm conclusions concerning demand levels at higher prices. Although a precise means of relating the impact of higher fuel taxes on consumption is not available, the short-term elasticity of gasoline demand to price probably would be quite small during a short-term emergency. In addition to the fact that several months lead time might be required to realize its effects, the simultaneous application of other use curtailment measures probably would cause demand elasticity to be less than otherwise expected. For these reasons, a surcharge is not considered a desirable approach to short-term gasoline demand reduction. In addition to its probable lack of significant impact on demand, a gasoline price increase resulting from a surcharge would have no beneficial effect on supply. An increase in price at the raw material level could, however, provide substantial long-term supply benefits.

Curtailment of Industrial Energy Use

The foregoing discussion deals mostly with curtailment of consumer uses of energy which would be translatable to equivalent oil savings. In addition to these measures, concurrent or alternative curtailments of industrial energy usage also would be possible. Although reducing consumer energy usage would likely have less impact on the national economy than industrial input reduction, an optimal mix of specific curtailment measures has not yet been determined.

While the curtailments shown in Table 5 are considered to be practical, it is not clear that the maximum reductions shown should be fully implemented prior to initiating some industrial curtailments. For example, it may be desirable, in terms of public preference, to begin reducing some energy-intensive and nonessential industrial activities before the indicated degree of automotive gasoline or other consumer-related oil cuts are attained.

Section Three

FUEL CONVERTIBILITY

Fuel convertibility refers to the ability of an energy-using activity to shift from one form of energy input to another. The Committee is now attempting to determine the extent to which the effects of an oil import denial might be offset by such fuel conversions. Possibilities include the conversion of oil consuming facilities to use of coal and/or natural gas. Other possibilities include increased use of electricity not derived from oil or gas.

Convertibility of utility boilers from oil and gas to coal is being investigated with the aid of a survey recently completed by the Federal Power Commission (FPC). Until these data are analyzed, only very tentative estimates can be made. It now appears that only about 250 thousand barrels per day could be saved by converting to coal in a short-term emergency. This relatively low figure results in large part from the fact that much of the former coal-burning and coal-handling facilities have been dismantled. It is also partially attributable to existing bottlenecks and deteriorations in the coal logistical system, as well as to mining limitations and the incompatibility of certain boilers and certain coals. These factors will be quantified as fully as possible in the final report.

A similar study is being made of convertibility to coal in manufacturing industries. The American Boiler Manufacturers Association is helping to supply data, but analysis of industrial boilers will be more difficult because it is not possible to obtain data on all furnaces, kilns, etc. The present estimate of coal convertibility for manufacturing industries is only about 25 thousand barrels per day.

Energy from nuclear fueled electric utilities may also offer a partial offset to oil import denials. There are several measures which would tend to increase the output of nuclear plants in an emergency:

- Expedite licensing procedures for equipment already installed.
- Allow nuclear power plants operating on limited licenses to increase their capacities.
- Delay refueling operations.

An indirect contribution to the alleviation of an emergency could derive from the diversion of the electricity from uranium enrichment plant operations to other electricity consumers to the extent that it could be handled by transmission systems. Studies to quantify these items are in progress.

Geothermal and hydroelectric energy sources will also be discussed in the final report. Although areas of important geothermal potential exist in the western United States, the use of natural subterranean steam could not provide any significant emergency energy capacity during the period through 1978. Also, additional hydroelectric energy has little potential since most of the usable sites in the United States have already been developed. It may be possible to accelerate the output of existing plants during an emergency, but the seasonal nature of hydroelectric resources make such an option undependable for emergency preparedness planning purposes.

As noted in Section Four under "Emergency Gas Production," the potential for additional gas usage in an emergency has not been established. Although some additional peak deliverability exists at the wellheads, the downstream ability to process and transport these additional volumes is limited. Any additional natural gas usage during the slack season (late spring and summer) would be largely limited to utility and industrial users specifically equipped with dual fuel systems. Also, the contractual rights of producers, distributors and consumers must be considered in any emergency allocation of natural gas supplies.

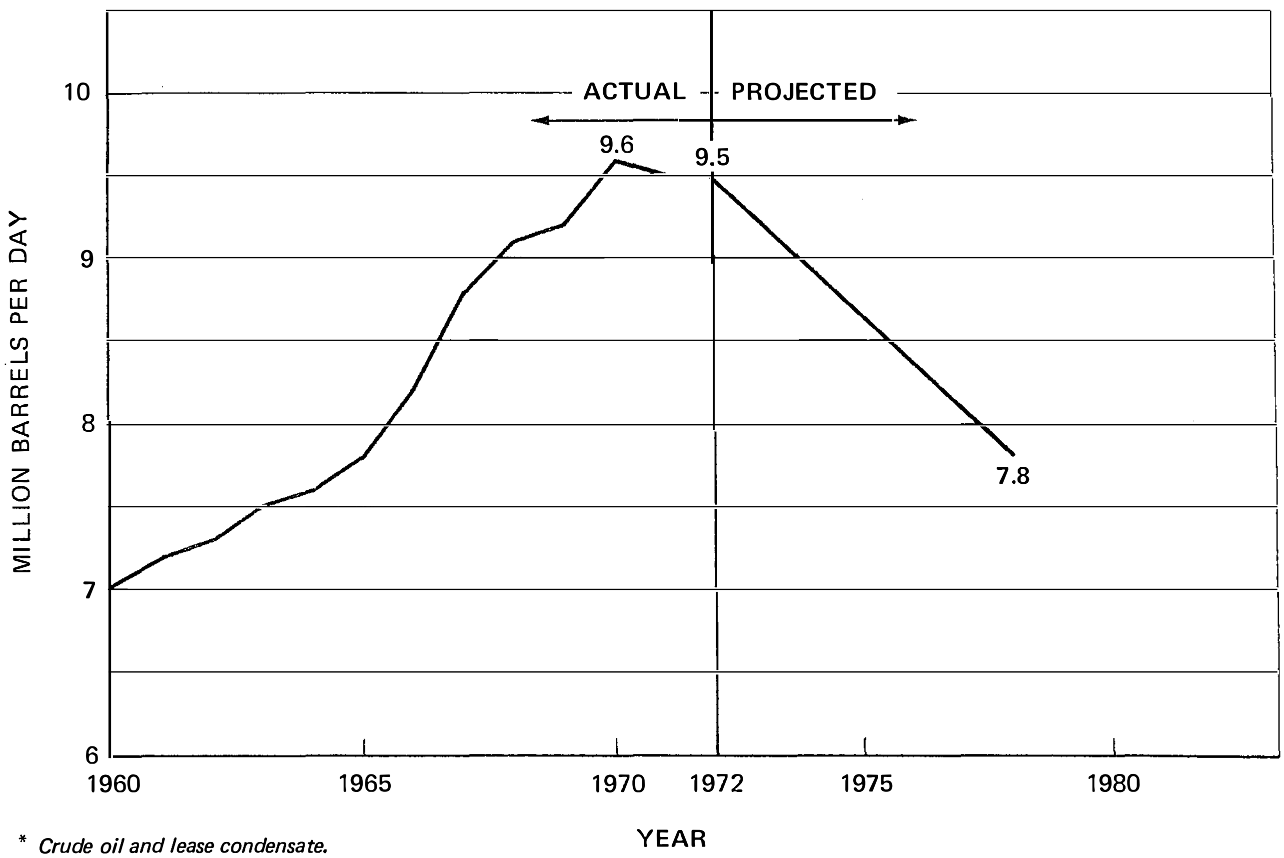
Section Four

EMERGENCY OIL AND GAS PRODUCTION

EMERGENCY OIL PRODUCTION IN EXCESS OF CURRENT RATES

Domestic crude and condensate production has increased from 7.0 million barrels per day in 1960 to a maximum of 9.6 million barrels per day in 1970, and since that time production has declined to about 9.2 million barrels per day (see Figure 1). This trend of declining production can be expected to continue and will reach about 7.8 million barrels per day by 1978, based on a continuation of present trends.

Domestic oil production is at capacity, and essentially all fields are producing at their legally established maximum efficient rate (except for Naval Petroleum Reserves, of which only NPR-1, Elk Hills Field, California, has major potential). The MER of a field is defined as the highest rate of production which can be sustained over a long period of time without reservoir damage and loss of ultimate oil and gas recovery. Production in excess of the



* *Crude oil and lease condensate.*

Source: Historical data - U.S. Bureau of Mines; Projected data - NPC U.S. Energy Outlook, Case IV.

Figure 1. Domestic Crude Oil Production--1960-1978.*

MER for sustained periods may result not only in loss of recovery but also in premature loss of producing capacity.

MER's are established by most of the major producing-state-regulatory agencies (or, in the case of federal offshore fields, by the Conservation Branch of the U.S. Geological Survey). They are based primarily on extensive reservoir performance data.

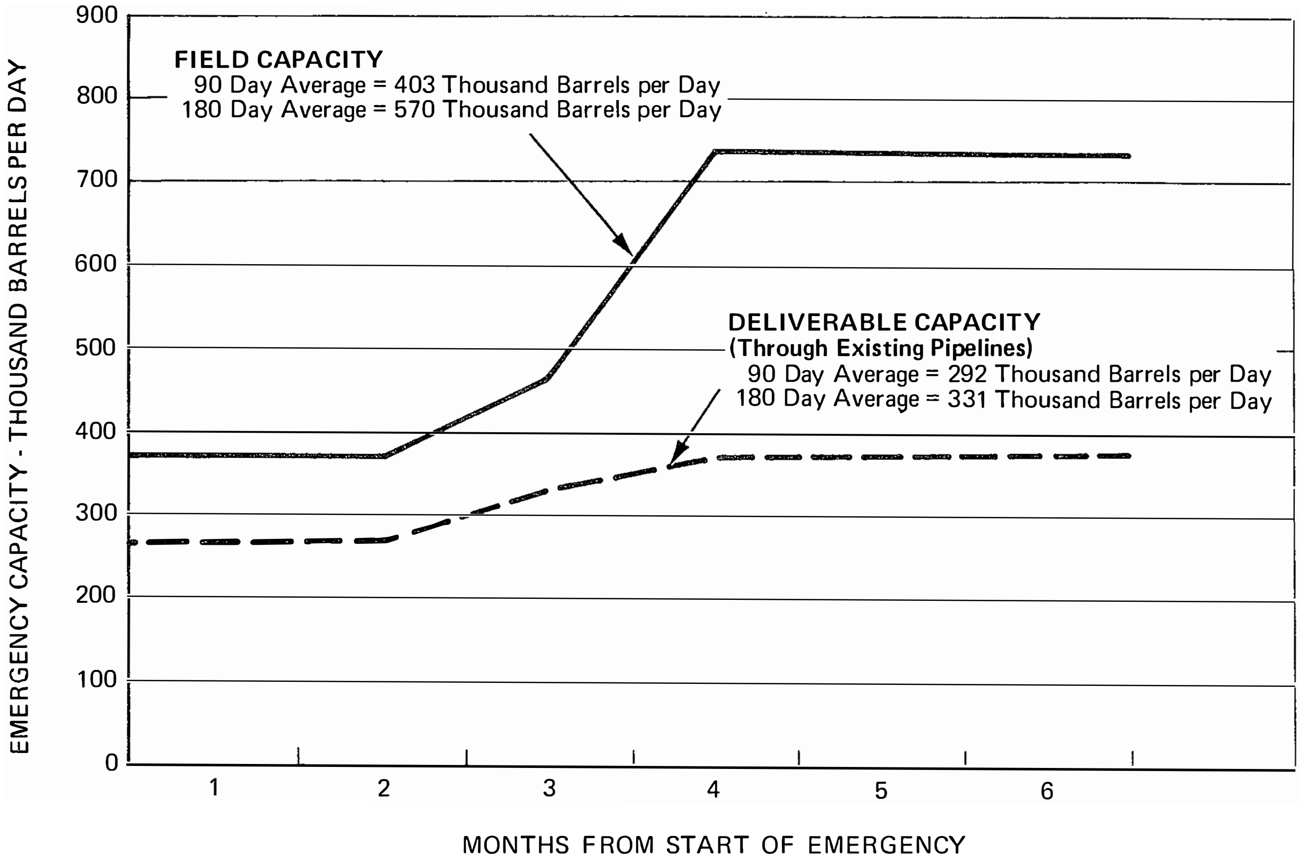
Existing laws in several of the major producing states require that the state regulatory agencies restrict, or prorate, production to market demand. This is accomplished by requiring most fields in the state to produce at some percentage of their MER to balance production with demand. In the past, this nominal spare capacity which existed between the production at the prevailing market demand factor and the MER provided a large measure of national security. However, all states and fields are now essentially producing at their MER, and no spare producing capacity exists (except at NPR-1).

Although the established MER's in existing fields represent the maximum rate of production which can be sustained without loss of recovery, it is possible in a limited number of fields to exceed the MER for short periods of time without reservoir damage. Precise definition of the amount and time period which production can be sustained in excess of the MER is highly dependent on the individual field. This study has not considered producing in excess of the MER for more than 6 months, and it is not anticipated that many fields could sustain such rates for much longer periods.

Any production in excess of the established MER entails some risk of losses in ultimate recovery. However, in a short-term emergency of the type defined in this study, these risks are minimal for the fields and capacities considered. On this basis potential emergency production capacity exists in a few large fields in Texas, such as East Texas, Yates, West Hastings, Hawkins and Tom O'Connor. These fields have indicated well deliverabilities in excess of their currently established MER's. Based on the type and quality of these reservoirs, it is reasonable to believe that they can be produced at rates in excess of the sustainable MER for periods of 90 to 180 days without excessive risk of losses in recovery. In addition, small amounts of spare capacity exist in a number of small scattered fields.

In each of the large fields, an estimate has been made of the amount of production in excess of the MER that can be obtained, based on reservoir, well and facility limitations, in response to an emergency occurring in 1974 or 1978. The additional capacity available from the small fields was based on American Petroleum Institute (API) published data. In addition, an estimate has been made of how much of this emergency capacity can be delivered to refining centers via existing pipeline systems. These emergency capacities are shown in Figure 2 for a 1974 emergency.

For an emergency occurring in 1974, the emergency capacity available in the field increases from about 370 thousand barrels



* *NPR-1 (Elk Hills) production does not exceed MER.*

Figure 2. Emergency Domestic Crude Production Capacity--1974 (Temporary Capacity in Excess of Current MER).*

per day during the first 2 months to 736 thousand barrels per day as additional facilities are added. The emergency capacity averages 403 thousand barrels per day for 90 days and 570 thousand barrels per day for 180 days.

Volumes deliverable to refineries are limited by the capacity of existing pipeline systems and average 292 thousand barrels per day for 90 days and 331 thousand barrels per day for 180 days. These deliverable volumes assume the use of trucking where possible, but lack of rail connections prevent use of tank cars. The principal sources of this emergency capacity are shown in Table 6.

The emergency production capacities in excess of MER estimated in this report differ substantially from the spare producing capacities estimated each year by the API. The principal reasons for this are differences in the definition of spare and emergency capacity. For example, the API defines spare capacity as the instantaneous rate which could be achieved at the field level on March 31 of each year. The API definition ignores pipeline limitations between the field and refineries and assumes that "intrafield equity considerations will be resolved." By contrast, the emergency capacities estimated in this study represent average rates for the period which can be produced and delivered.

TABLE 6

SOURCE OF EMERGENCY CRUDE PRODUCTION CAPACITY— TEMPORARY CAPACITY IN EXCESS OF CURRENT MAXIMUM EFFICIENT RATE—1974
(Thousand Barrels per Day—Average for Period)

Field	90 Days		180 Days	
	Additional Capacity Deliverable to Trunk Lines	Additional Capacity Deliverable to Refineries	Additional Capacity Deliverable to Trunk Lines	Additional Capacity Deliverable to Refineries
East Texas	40	40	120	41
Yates	50	50	75	55
West Hastings	0	0	30	13
Tom O'Connor	60	22	60	22
Hawkins	40	5	40	5
NPR-1 (Elk Hills)*	32	12	63	23
Others†	181	163	182	172
Total‡	**403**	**292**	**570**	**331**

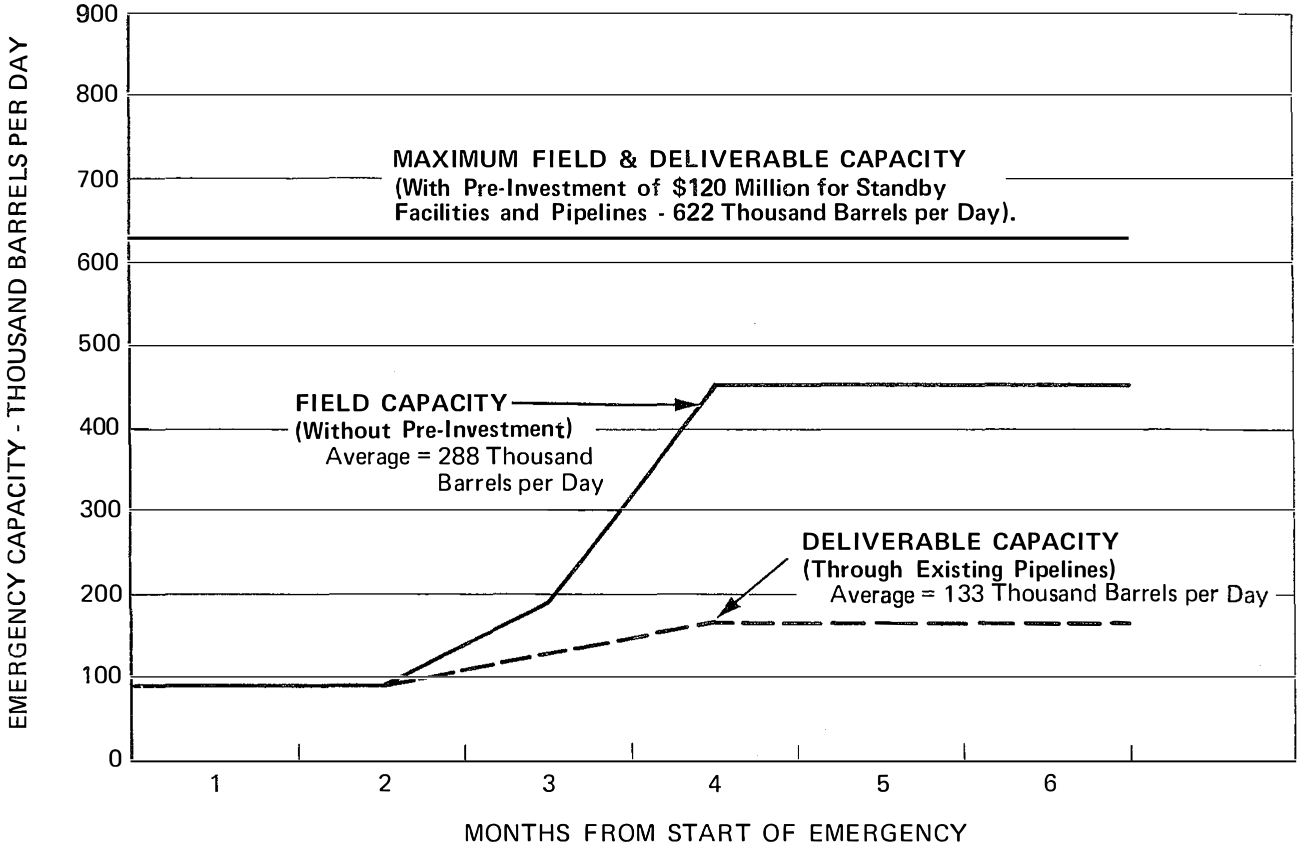
* NPR-1 does not produce in excess of its maximum efficient rate.

† Other includes field level capacities of 42,000 barrels per day from the Uinta Basin, 78,000 barrels per day in 8 fields (as defined by the API with either 25,000 barrels per day production or 5,000 barrels per day of spare capacity) and 61,000 barrels per day from undesignated fields.

‡ These emergency capacities differ from the spare producing capacity estimated by the API due to differences in definition of spare capacity.

Attainment of the emergency capacities in the field will require some gas flaring and investments of approximately $8 million for additional field production facilities. These include additional oil treating and handling equipment, minor expansions of oil and gas gathering systems, additional saltwater disposal facilities (particularly in the East Texas field), and temporary compressor facilities to minimize gas flaring. These facilities can be generally added within the first 90 days of an emergency and should pay out based on the temporary additional production during the emergency.

The emergency capacity in excess of the MER which could be available in 1978 is illustrated in Figure 3. The total potential emergency capacity is reduced from the 1974 volume because of declining production in many of the fields, and all but a few large fields are producing at capacity. Assuming that no major pre-investments are made in standby production or pipeline facilities, the emergency capacity in the field will increase from about 90 thousand barrels per day initially to 450 thousand barrels per day and will average 288 thousand barrels per day during the emergency (see Figure 3). Major sources of this capacity are shown in Table 7. In this case, field level facility investments of about $7 million are required to achieve these capacities, and they should pay out during the emergency. Again, the deliverable production is limited by existing pipelines to an average of only 133 thousand



* *NPR-1 (Elk Hills) production does not exceed MER.*

Figure 3. Emergency Domestic Crude Production Capacity--1978 (Temporary Capacity in Excess of Current MER).

TABLE 7

**SOURCE OF EMERGENCY CRUDE PRODUCTION CAPACITY—
TEMPORARY CAPACITY IN EXCESS OF CURRENT MAXIMUM EFFICIENT RATE—1978
(Thousand Barrels per Day—Average for Period)**

	Without Pre-Investment for Standby Facilities		With Substantial Pre-Investment for Standby Production and Pipeline Capacity*	
Field	**Additional Capacity Deliverable to Trunk Lines**	**Additional Capacity Deliverable to Refineries**	**Additional Capacity Deliverable to Trunk Lines†**	**Additional Capacity Deliverable to Refineries‡**
East Texas	120	42	200	200
Yates	75	55	100	100
West Hastings	30	13	60	60
NPR-1 (Elk Hills)§	63	23	262	262
Total	**288**	**133**	**622**	**622**

* These investments require lead times of 1 year or more and will not be made in the course of normal operations.

† Requires facility investments of $90 million ($69 million at Elk Hills).

‡ Requires pipeline investments of $30 million ($25 million at Elk Hills).

§ NPR-1 (Elk Hills) production does not exceed maximum efficient rate.

barrels per day. The principal pipeline limitations occur at Elk Hills and at East Texas.

It would be possible to increase the amount of emergency capacity available and deliverable in 1978 to 622 thousand barrels per day by pre-investment of about $120 million in long lead time standby production and pipeline facilities. About $94 million of this investment is required to develop NPR-1 to its indicated MER of 267 thousand barrels per day ($69 million to develop the field and $25 million to provide standby pipeline capacity). Other items include standby gas processing facilities at East Texas, Yates and West Hastings and standby pipeline capacity from East Texas and Yates. Except for possible emergency use, the installation of these items would be unlikely and unjustifiable by normal operations.

It should be emphasized that the emergency capacity estimates in this study represent an optimistic assessment of what can be accomplished. Numerous legal and administrative obstacles would have to be overcome before these capacities can be attained. The MER's for the Texas fields have been established by the state regulatory agencies, and action by this body will be required to exceed them. In addition, substantial differences of opinion exist among the operators in most of these fields regarding the MER, and in some cases litigation is involved. The higher emergency rates can be obtained by permitting all wells in the field to increase their production rather than by producing only certain selected wells. Although this would appear to be the most equitable approach, it is anticipated that controversies and possible litigation will result over changes in intrafield equities during the periods of increased production. Also, attainment of the estimated emergency rates in many fields will require the relaxation of various environmental regulations, particularly those regarding gas flaring.

Many of these obstacles can be overcome through pre-planning, including the establishment of emergency preparedness plans. This will require the full participation of both state and federal regulatory agencies as well as the operators. Specifically, it will be necessary to establish in advance the level of emergency production permitted in each field and guidelines regarding the relaxation of environmental and other regulations. In the case of NPR-1 (Elk Hills), action by the Federal Government is required to permit production of this reserve in an emergency. Early initiation of this type of emergency preparedness planning is imperative if these capacities are to be realized. In the absence of such planning, the attainable emergency capacity is likely to be negligible

EMERGENCY GAS PRODUCTION

Emergency gas producing capacity must also be considered in emergency preparedness planning since the opportunity may exist to substitute natural gas for liquid fuels. An attempt has been made to determine the maximum potential amounts of emergency gas production capacity on a nationwide basis. However, a detailed evaluation has not yet been made of how much of this capacity can be delivered to effective users.

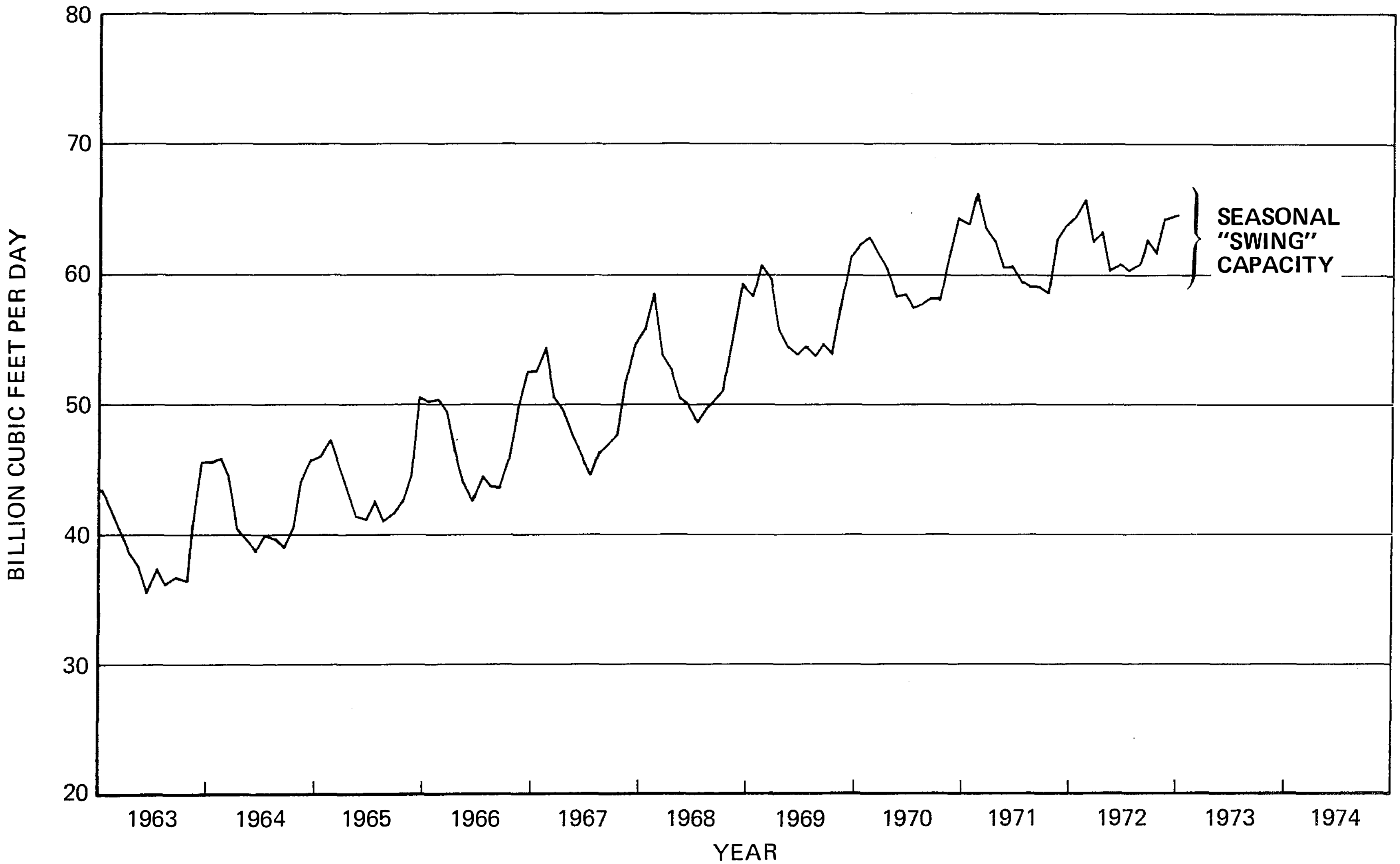
Three possible sources of emergency gas production capacity exist in both 1974 and 1978. First is the additional associated and dissolved gas produced in conjunction with the additional oil discussed previously. These volumes are relatively small, and in most cases transmission line limitations probably prevent delivery of this additional gas. Maximum associated and dissolved gas volumes resulting from the deliverable oil capacities estimated in 1974 are about 150 million cubic feet per day. In 1978, about 50 million cubic feet per day could be available without major pre-investments while about 330 million cubic feet per day could be available with pre-investment of $120 million.

A second potential source of emergency gas capacity results from the traditional seasonal demand and production of natural gas. During the high demand winter months, production is at a peak and gradually declines to a low during the summer months (see Figure 4). The difference between the winter peak production and the lower rates in the summer (or seasonal swing) obviously can be produced and delivered by existing trunk pipelines.

The projection of the seasonal swing capacity to 1974 has been made on a gross nationwide basis, using U.S. Bureau of Mines production data. In 1974, this swing capacity is projected to vary from zero in January to about 4,000 million cubic feet per day in June, averaging about 1,700 million cubic feet per day for a 180-day emergency beginning in January.

A third potential source of emergency gas production is spare capacity in excess of the winter peak production. Each year the American Gas Association (AGA) estimates total domestic gas producing capacity. Comparisons of projections of this capacity with the projected peak production rates indicate that based on the AGA definition, appreciable volumes of spare capacity could exist in 1974 and 1978. However, according to the AGA definition, spare capacity consists of gas which is producible at the wellhead without regard to the capacity of flowlines and gathering systems, field compression and processing facilities, or trunklines. Also, this includes gas which is utilized in pressure maintenance and cycling projects which, if diverted, would result in reduced liquid recovery and/or reduced ultimate oil recovery. These are not spare capacities which can be made readily available.

The usable volumes of emergency gas production are likely to be limited for several reasons. The emergency gas production is scattered in a number of large fields, primarily in Texas, Louisiana, Oklahoma and Kansas. In most cases, it is anticipated that transmission facilities from these areas are at capacity or are not suitably located to deliver this gas to potential users in an emergency. Also, existing contractual commitments for these gas reserves as well as intrafield equity considerations and FPC regulations are likely to present major obstacles to utilizing these additional volumes of gas. For these reasons, potential emergency gas volumes were not considered to be available in this Interim Report. Additional detailed study will be required to define how much, if any, of these volumes could be used in an emergency.



* *Marketed production is non-associated and associated-dissolved wellhead production less lease use, field use and losses.*

Source: U.S. Bureau of Mines.

Figure 4. Marketed Natural Gas Production--Total United States.*

Section Five

ALTERNATIVES FOR MAINTAINING EMERGENCY STANDBY PETROLEUM SUPPLIES

GENERAL

Given adequate planning and lead time, there are two basic methods which can be used for providing additional standby petroleum supplies for emergency use. These include storage of crude oil or products and restricting domestic production to provide emergency crude supplies.

Alternatives to storage of emergency petroleum supplies include aboveground storage in steel tanks or underground storage in salt domes, mined caverns or abandoned mines. Restriction of production alternatives consists of nationwide prorationing or shutting in selected fields. This section includes a discussion of feasibility and initial construction costs for the various storage options followed by a comparison of the relative economics of storage and restricted production as means of providing emergency standby petroleum supplies.

Any emergency standby petroleum supply system must meet two requirements: (1) It must include sufficient volumes of crude oil or products to satisfy the need and (2) it must have the capacity to deliver this crude or product at the required daily rate. For example, if protection against an interruption of 3 million barrels per day for 180 days is required, 540 million barrels of crude oil or product is needed, and, more important, capacity must be provided to deliver the crude or product at a rate of 3 million barrels per day.

The alternatives which involve maintaining reserves in the ground by restricting production have the disadvantage of requiring a large total volume of reserves to provide a desired daily producing capacity. This results from the basic mechanism of fluid flow in petroleum reservoirs. Extensive investigations have shown that the producing capacity of most domestic reservoirs will begin to decline when the annual reserves/production ratio (R/P) drops below 8.0. At an R/P of 8.0, one-eighth or 12.5 percent of the reserves are produced per year. Thus, to provide protection against a 6-month, 3 million barrels per day interruption (540 million barrels total) shut-in reserves of 8.8 billion barrels (3 million barrels per day x 365 days x 8) would be required. Although some fields can and do produce at lower R/P's, it is doubtful if enough reserves of this type exist to provide an appreciable amount of shut-in protection.

On the other hand, storage requires producing and transferring only the needed volume of oil into storage where it can be delivered at very high rates when an emergency occurs. For example, in comparison to the requirement of 8.8 billion barrels mentioned previously, only 540 million barrels are required to provide protection against the 6-month, 3 million barrels per day interruption.

ABOVEGROUND STORAGE

Aboveground tank storage provides flexibility in meeting storage and logistics requirements. Tankage may be constructed in increments and locations as required by individual organizations. Given storage criteria, each organization can determine the best location for its storage, considering marketing, refining and transportation requirements. Specific locations of tank farms tend to be in less populated areas because of land requirements and costs. Tank farms require 20 to 30 acres per 1 million barrels of storage. Tank farm design and operation has been established over many years and has been compatible with a wide range of environments.

The capacity to construct steel tankage may be a limiting factor in a program of standby storage. About 3,000 tons of steel are required per million barrels of storage capacity. Steel plate fabricators in the United States are currently experiencing strong demand, and it is doubtful that the total amount of steel necessary to establish a storage system of this type can be made available in the short term. Recent production of the steel plate fabrication industry is shown in Table 8. While no breakdown of tankage alone is available, it is believed that tankage is the major component of the tanks, bins and hopper category. Thus, an addition of 100 million barrels of storage volume would equal about a 1-year fabrication capacity.

TABLE 8

PRODUCTION OF THE STEEL PLATE FABRICATION INDUSTRY
(Thousand Tons)

	1970	1971	1972
Tanks, Bins and Hoppers	420	320	360
Total Plate Fabrication Including Tanks, Bins and Hoppers	640	480	530

The cost of steel storage is dependent partially on local construction requirements. With normal soil conditions, tanks may be built on a simple foundation, although pilings are required in some locations. Hence, tankage costs for normal foundation requirements will be about $3 per barrel of shell capacity. If pile foundations are required, tankage costs increase to about $5 per barrel. Both of these costs represent minimal facilities and exclude the cost of pipelines connecting the facility to trunk lines or consumption points and the cost of crude or products to fill the storage.

UNDERGROUND STORAGE

Three proved methods exist for providing underground storage of crude or liquid petroleum products. These are (1) cavities leached in salt domes or salt beds, (2) cavities mined in hard impermeable rock formations such as granite, shale or limestone and (3) abandoned underground mines which have been specially adapted for storage.

Currently, about 200 million barrels of domestic underground storage exists. About 65 percent of this capacity is located in cavities leached in salt domes, about 28 percent in cavities leached in salt beds and about 7 percent in mined cavities in hard rock.

A wide variety of light hydrocarbon products and petrochemical feedstocks are stored underground domestically. Although no crude is stored underground in the United States, over 100 million barrels of crude storage is installed, under way or planned in Europe. Underground storage of crude or products results in minimal product loss and provides maximum protection against the hazards of fire, storm or even sabotage.

Salt Dome Storage

About two-thirds of the domestic underground storage capacity is located in salt domes. A salt dome is a massive column of rock salt from 0.5 to 6.0 miles across, topped by a thick cap rock, thrusting upward from a salt bed thought to lie about 30,000 feet below the surface (see Figure 5). The top of the salt may reach very near the surface, and in many cases the salt from these domes has been mined for commercial use. There are more than 350 known salt domes lying beneath an area of 50,000 square miles along the Gulf Coast (see Figure 6).

A remarkable record of safety and reliability of underground storage for petroleum products has been established by industry in more than 20 years of experience in the development and operation of over 100 million barrels of salt dome storage capacity. Individual storage capacities now commonly range from 1 million barrels to over 2 million barrels per well and a number are designed to store up to 5 million barrels.

Underground storage in leached salt dome cavities can be provided at initial construction costs ranging from $0.40 to $0.70 per barrel (excluding the cost of pipelines connecting the facility to trunk lines or consumption points and the cost of crude or products to fill the storage). These costs are valid only for large volume (100 to 200 million barrels) projects consisting of wells having individual capacities of 5 to 10 million barrels.

These costs are based on a detailed analysis of two typical salt domes on the Texas and Louisiana Gulf Coast. Each dome could be developed to a total capacity of at least 200 million barrels,

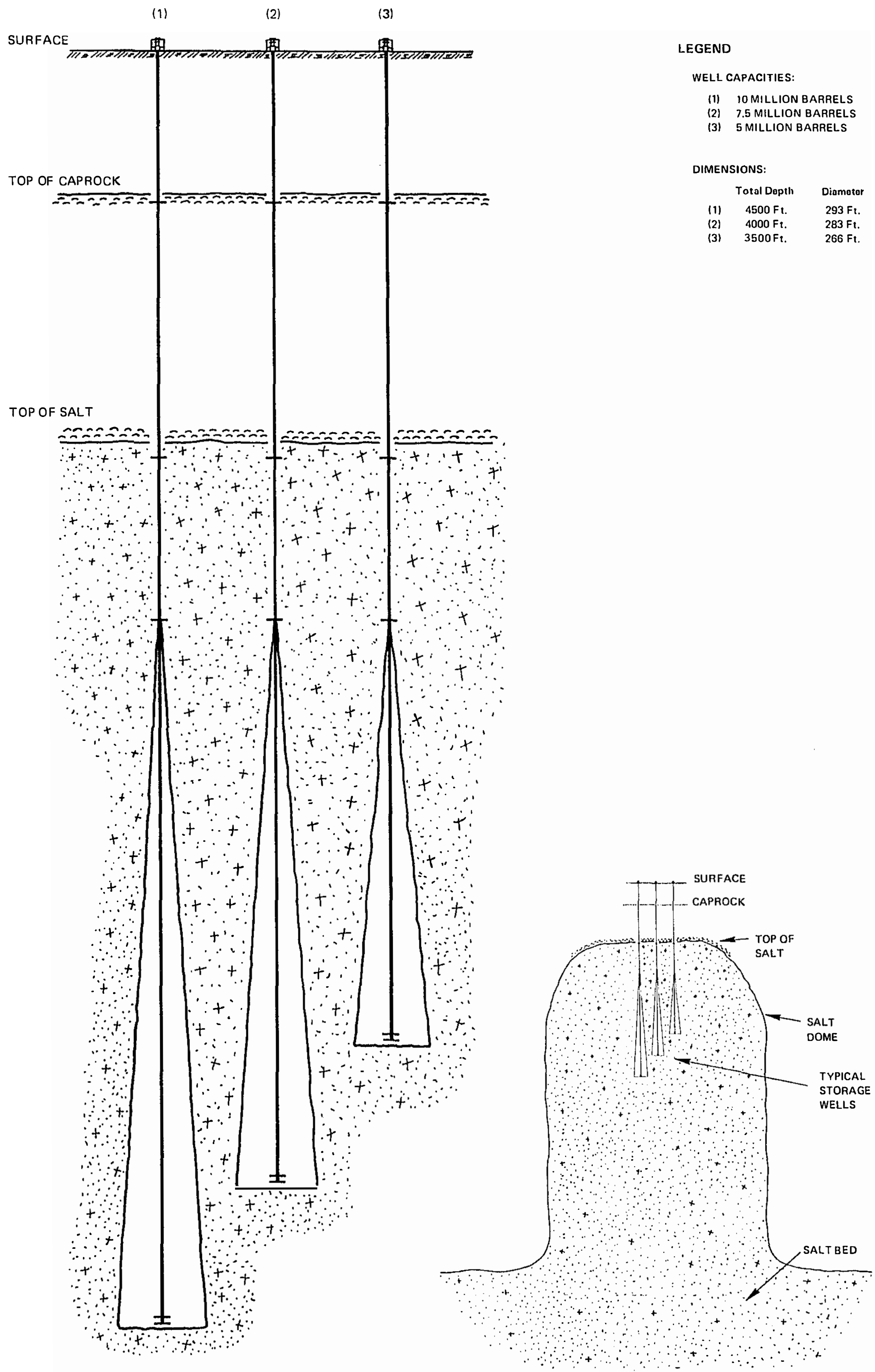


Figure 5. Typical Salt Dome and Storage Wells.

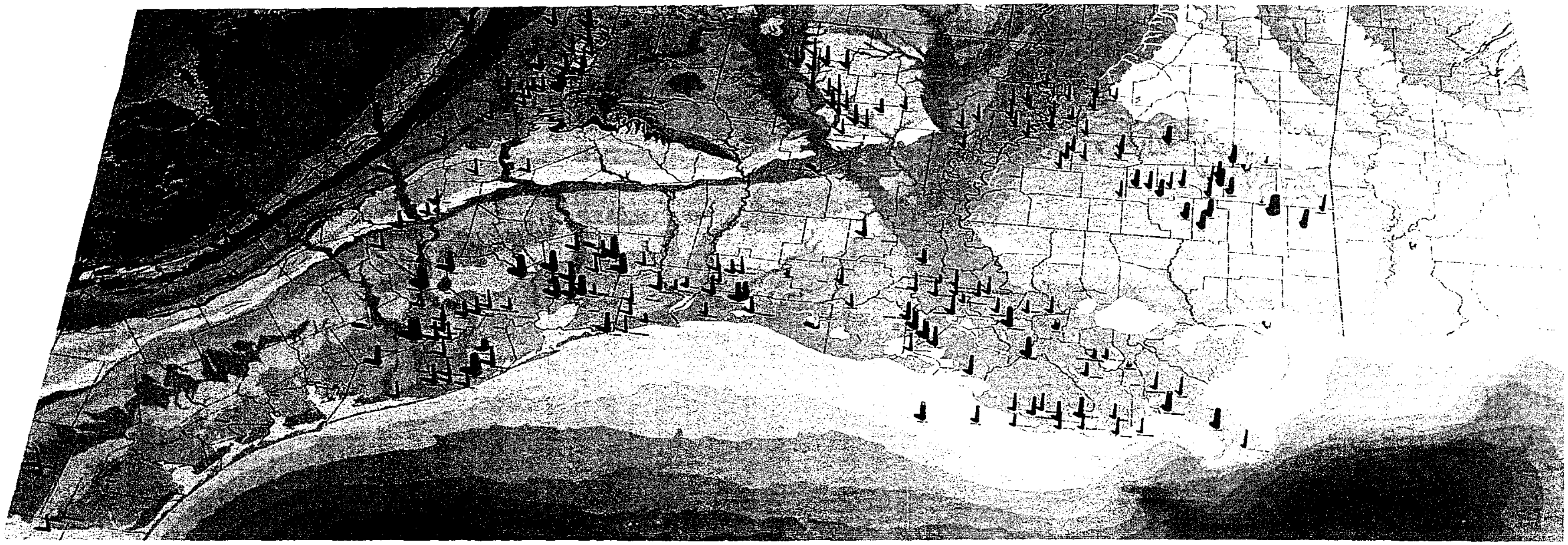


Figure 6. Map of Texas-Louisiana Gulf Coast Showing Salt Dome Locations.

using 20 to 25 wells, with a capability of delivering the stored crude at a rate of at least 1 million barrels per day from each dome.

Cost estimates are based on 5 years to fully develop each site, with usable storage becoming available at a rate of 40 million barrels per year after the first year. Thus, about 100 million barrels of usable storage would be available at each site after 3.5 years.

The costs estimated for salt dome storage in this study are based on a plentiful and inexpensive supply of fresh water to leach the cavities and on offshore disposal of the brine. About 10 barrels of fresh water are required to leach 1 barrel of storage. As a result, storage costs can be substantially affected by the availability and cost of large volumes of fresh water. If the freshwater costs used in this study are increased by a factor of 10, the per barrel storage costs would be increased by about $0.20.

The assumption of offshore disposal of the brine is even more critical since about 1.2 million barrels per day of brine is produced from development of a 200 million barrel storage site in 5 years. Subsurface disposal of these volumes would be extremely costly and would be physically impossible in most locations.

It is recognized that the freshwater requirements and brine disposal considerations associated with large volume salt dome storage projects of this type raise environmental questions. These questions will of course have to be addressed in the planning, authorization and execution of specific projects. However, it is believed that in most Gulf Coast locations, sufficient freshwater supplies can be obtained and that the environmental effects of disposal of the essentially pure sodium chloride brine through a properly designed disposal system to the Gulf will be small.

Storage cavities leached in salt beds are also a proved technique, although several factors limit the potential utility of these beds for large volume emergency storage projects. Most beds are located in inland areas where freshwater costs are relatively high and where subsurface brine disposal would be required, making the large volume projects impractical. Also, the generally thinner beds and the presence of layers of impurities make large volume projects more difficult.

Mined Cavern Storage

There are currently 40 to 50 storage projects in mined caverns in hard rock. These vary in size with a maximum of about 800,000 barrels and generally are used to store light products under pressure.

Storage costs in mined cavities are estimated to range from $5 to $10 per barrel. The construction time for a mined storage project is 1 to 2 years.

Storage in Abandoned Mines

Storage of crude in specially converted abandoned mines is a proved technique. Although no such storage exists in the United States, a large project has been in operation in South Africa since 1969. Costs for this type project may be competitive with salt dome storage if suitable mines can be found. Extensive surveys are required to confirm the suitability of a mine for conversion to storage.

Storage in Depleted Reservoirs

The possibility of storing crude in depleted reservoirs has been raised in the past. This type of storage is not considered to be practical for several reasons. The volume at which the crude can be injected into the porous reservoir rock and the rate at which it can be recovered are limited. In addition, experience indicates that product losses are likely to be high.

Gas Storage

Nearly 6 trillion cubic feet of underground gas storage capacity currently exists in the United States for use by gas utilities. The cost to develop new working gas storage capacity is about $1,000 to $1,250 per million cubic feet.* This is about 10 times as expensive as salt dome crude storage on an energy equivalent basis. The utility of gas storage is expected to be limited in an emergency preparedness plan.

Summary of Underground Storage

Based on the results of this study, the storage of large volumes of crude and/or products in leached salt dome cavities is the least expensive underground storage alternative, and the technology has been developed and applied extensively in practice. Other underground storage techniques such as mined caverns and leached cavities in salt beds have limited application in large volume projects due to costs and/or technical considerations. Storage of crude in abandoned mines may offer a competitive alternative to large volume salt dome storage in certain locations.

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* About 50 percent of the reservoir capacity in gas storage projects is occupied by a permanent inventory of base or cushion gas which is needed to maintain the deliverability of the "working gas."

The salt dome storage cost estimates are based on a 5-year development program. However, it would be possible to accelerate the development of salt dome storage in order to make available 3 million barrels per day for 180 days in 1978, although this acceleration would take place at somewhat higher costs. This step-up in storage development could be accomplished by a combination of accelerating the rate of washing storage and starting work simultaneously on several sites. The additional cost would not exceed the $1.00 per barrel storage cost sensitivity shown in Table 9.

TABLE 9

UNIT COSTS OF PROVIDING STANDBY EMERGENCY SUPPLIES
(Present Value Cost per Unit of Supply—$/Barrel/Day*)

	7% Interest Rate
Salt Dome Storage	
$ 0.40 per Barrel Facility Cost	530
$ 1.00 per Barrel Facility Cost	630
Steel Tank Storage	
$ 3.00 per Barrel Facility Cost	920
$ 5.00 per Barrel Facility Cost	1,230
Production Restriction by Shutting in Fields or by Prorationing	4,800-5,200

* Basis:
- Emergency capacity initiates in 1975 and reserves retained until 1995 when they are sold.
- Costs are present value costs to the operators, royalty owners and federal, state and local governments.
- Oil prices in 1974 equal $ 3.54 per barrel and in 1985 equal $ 5.28 per barrel based on U.S. Energy Outlook Case IV. Prices were held constant after 1985. Recent oil price increases suggest that this price schedule is understated.
- Unit costs are calculated based on providing full protection for 3 million barrel per day, 180-day interruption.
- Costs are calculated in constant 1973 dollars. In addition, all construction estimates are based on 1973 cost data.

COST ELEMENTS FOR MAINTENANCE OF EMERGENCY STANDBY SUPPLIES

The cost of maintaining any type of emergency standby supplies is a combination of several factors. First is the initial cost of establishing the emergency supply--for example, the cost to build steel tanks or salt dome storage facilities and to fill the storage with crude or products. Second is the cost of maintaining the standby supplies. This includes the cost of direct labor and equipment needed to maintain the ability to produce in an emergency. An additional cost item includes the cost of constructing standby pipeline and transportation systems.

Finally, a major cost item is the loss in present value to industry and government which results from deferring the production and sale of the standby supplies.* For example, consider the case of shutting in existing fields to provide emergency spare capacity. Under normal conditions, these fields would be produced to depletion over a period of years with resulting income to the producers and royalty owners from the sale of the oil and gas and income to local, state and federal governments in the form of production, sales and income taxes. In this study, it was assumed that emergency protection would be required for 20 years, at which time alternative energy forms would be available. Thus, if the fields were shut in to provide standby supplies for 20 years and then produced, these incomes would be deferred for 20 years which would result in a substantial loss in present value to the operators, royalty owners and governments.

In the case of storage, the sale of crude or products necessary to fill the storage must also be deferred. These products would then be sold after 20 years with a loss in present value which is substantial, but far less than for the shut-in reserve case due to the smaller total volumes.

COMPARISON OF TOTAL PRESENT VALUE COSTS OF ALTERNATIVE METHODS FOR PROVIDING EMERGENCY STANDBY SUPPLIES

To effectively compare the cost of maintaining emergency standby supplies, it is necessary to compare the costs on a unit of capacity basis. These comparisons are based on the total present value cost per barrel per day of emergency supply. This comparison was based on the 3 million barrels per day, 180-day interruption example specified by the Secretary of the Interior and assumes that the total denial would be offset by storage or production restrictions. It is beyond the scope of this study to postulate the desired level of protection or the amount of that protection to be provided by storage or shut-in capacity.

The unit costs presented in Table 9 represent the onsite costs for large volume production restriction or storage projects. The cost and problems associated with transporting the emergency standby supplies to points of consumption such as refineries are not included. Depending on the volume and source of the emergency interruption and the type of interruption (crude or products), these logistical considerations could be significant. These will be ad-

* The "present value concept" simply recognizes the fact that a dollar received today is worth more than a dollar received some years in the future by the amount of interest or return that dollar can be expected to earn. For example, if a dollar received today were invested in bonds, a savings plan or some other investment which earned interest at a rate of 7 percent, it would be worth $1.97 in 10 years. Conversely, a dollar of income received 10 years in the future is worth only $0.51 today, assuming a 7 percent interest rate. This is a common and well accepted method of comparing the present value of various future income streams.

dressed in detail in the final report. However, the unit costs at the field level do provide a valid basis for ranking the costs of various emergency supply systems.

The results of the cost evaluations are summarized in Table 9. They indicate that storage in steel tanks or salt domes is a less expensive method of providing emergency standby supplies than restricting production.

The total present value cost of storage is only 10 to 20 percent of the restricted production alternative. Present value costs in Table 9 are based on a discount rate of 7 percent. Various sensitivity cases were evaluated at higher discount rates, higher prices and more optimistic R/P's for the restricted production options. Although the absolute costs of the various alternatives changes in these cases, the ranking of the alternatives did not.

ABOVEGROUND STORAGE COSTS

The present value cost of providing emergency standby supplies by steel tank storage is about $920 per barrel per day based on a $3.00 per barrel initial construction cost for the facilities. A $5.00 per barrel initial facilities cost results in total costs of $1,230 per barrel per day of standby supplies. In the 3 million barrels per day, 180-day interruption example, total initial facility costs range from $1,700 to $2,840 million based on $3.00 to $5.00 per barrel construction cost. The inventory cost is about $2.2 billion based on crude storage filled over a 3-year period 1976 to 1978 at an average oil price of $4.04 per barrel. In view of recent events, the $4.04 per barrel figure may well be understated for this time period.

UNDERGROUND STORAGE COSTS

The present value cost of providing emergency supplies by means of salt dome storage is about $530 per daily barrel based on a minimum cost of $0.40 per barrel for construction of the facilities. If the construction costs are $1.00 per barrel, the total cost increases to $630 per barrel per day of standby supply. In the 3 million barrels per day, 180-day example assumed in the comparison, a total initial expenditure of $227 to $567 million would be required for the 540 million barrels of salt dome storage capacity. Again, an additional $2.2 billion would be required to purchase the inventory.

This evaluation indicates that the total present value cost of salt dome storage is about half that of steel storage. These costs are based on large volume projects. It is likely that transportation and operating considerations will make emergency storage in steel tanks more attractive to individual companies in many specific locations.

SOURCE OF STORAGE INVENTORY

Assuming that a combination of steel and salt dome storage is selected to provide protection against a 3 million barrels per day emergency, a total volume of about 540 million barrels of crude would be required. If the storage were developed and filled over a 3-year period, about 500 thousand barrels per day of crude would be required. This volume, if obtained through domestic demand reductions or increased imports, will have an appreciable impact on the economy and on the already tight U.S. and worldwide crude oil supply situation.

Alternative methods for providing supplies to fill storage will be addressed in more detail in the final report. However, one obvious way to minimize the impact of filling storage and to supplement the supply situation is to develop and produce NPR-1 (Elk Hills Field) at capacity. This would have the effect of transferring a portion of these resources into storage.

Although the impact of filling 540 million barrels of storage can be significant, it is small compared to the supply/demand effects of providing protection by shut-in reserves which require removing 3 million barrels per day from domestic crude supplies and increasing imports by the same amount.

DISCUSSION OF RESTRICTING DOMESTIC PRODUCTION

The total present value cost of providing emergency capacity by means of shut-in reserves is quite high ($4,800 to $5,200 per barrel per day of capacity), which makes this option unattractive. However, in view of the extensive discussion this approach has received in the past, it is appropriate to review some of its other disadvantages.

Shut-in emergency reserves could be provided by nationwide proration of current production to some percentage of capacity sufficient to provide the desired level of protection. To provide 3 million barrels per day of protection requires shutting in 3 million barrels per day of crude production through proration. This is about one-third of current domestic production or 85 percent of the production from the state of Texas. However, much of the existing production is not suitable for proration. About 15 to 20 percent of today's crude production is from very low volume wells which are economically marginal, and about 25 to 30 percent is produced under some type of improved recovery (water flooding, etc.) designed to increase ultimate oil recovery. Curtailment of these operations would result in actual loss of production and capacity through premature abandonments, and in the loss of ultimate recovery. Thus, only about one-half of the current production could be prorated, resulting in a proration factor of 33 percent for primary production. This would have a drastic economic impact on the operation of existing fields and would also drastically reduce incentives for the development of additional domestic reserves.

Furthermore, proration would require a massive administrative system and would likely result in extensive litigation seeking compensation for the deferred production.

Shutting in selected fields to provide 3 million barrels per day of protection would also result in the direct reduction of domestic supplies by 3 million barrels per day and cause the shut in of about 8.8 billion barrels of reserves. In addition, it would result in major legal problems since most leases cannot be maintained without actual production. Also, large monetary compensation would be required for the operators and royalty owners in the shut-in fields, and state and local governments might also seek compensation for losses in tax revenues. It is likely that extensive litigation would result over the value of the shut-in reserves. Also, the difficulty of maintaining trained personnel and equipment during long shut-in periods represents a major operating problem. However, even more important would be the difficulty of replacing 3 million barrels per day of supplies with foreign imports and the balance of trade implications of such a necessity.

The possibility of finding new reserves which would be shut in to provide emergency supplies has also been raised. In view of the volume of reserves required to provide 3 million barrels per day of protection (8.8 billion barrels), it would be necessary to look to such undeveloped but high potential areas as the offshore and the Arctic. For example, finding 8.8 billion barrels of reserves is equivalent to finding nine fields the size of East Texas or Wilmington. The total present value cost of finding and shutting in reserves is at least as high as shutting in existing reserves which, as discussed previously, is an unattractive alternate for maintaining emergency supplies.

NAVAL PETROLEUM RESERVES

Between 1912 and 1924, Executive Orders established four Naval Petroleum Reserves. The purpose of these reserves is to maintain petroleum resources in a standby production status until needed for national defense.

NPR-1 and NPR-2 are located west of Bakersfield, California. NPR-3 is located northeast of Casper, Wyoming, while NPR-4 is located on the North Slope of Alaska. Figure 7 illustrates the location of the Naval Petroleum Reserves.

NPR-1 is presently producing approximately 4 thousand barrels per day. The Office of Naval Petroleum Reserves estimates that the maximum efficient rate of production would approximately 267 thousand barrels per day, with an additional investment of $69 million.

NPR-2 has been under lease to private operators for about 50 years and is presently producing at a capacity of 7.9 thousand barrels per day. In 1971, a Navy geologist advised that exploratory

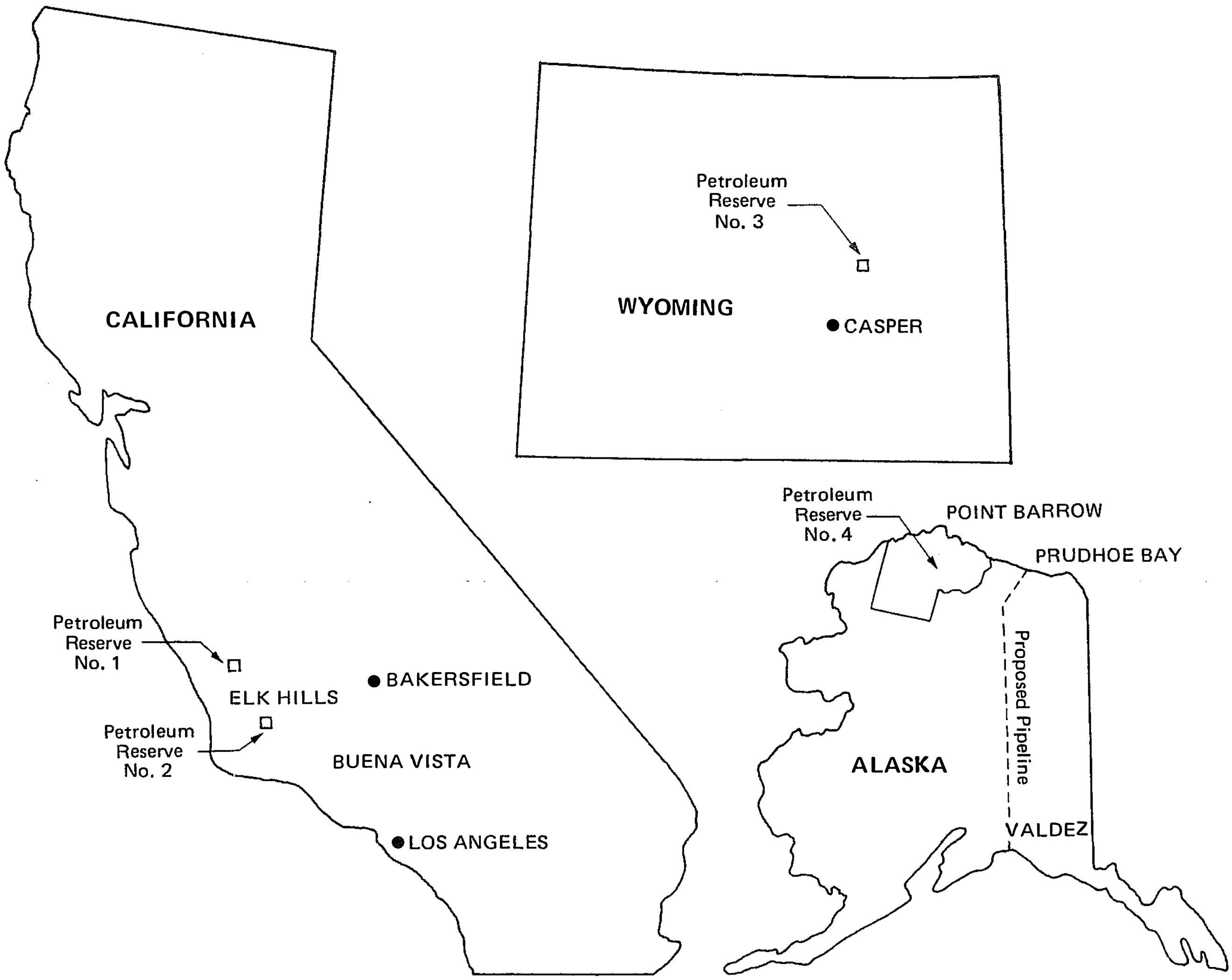

Figure 7. Naval Petroleum Reserves.

drilling had not resulted in the location of any additional producible oil deposits. Therefore, it appears that no additional oil could be obtained from NPR-2.

NPR-3 has a current productive capacity of about 1 thousand barrels per day, half of which is being produced. With additional investment of about $9.4 million, it is estimated that the maximum efficient rate of production could be increased to 5.2 thousand barrels per day.

NPR-4 has not been fully explored or developed, and no oil is being produced. This reserve, containing approximately 24 million acres, is located near the Prudhoe Bay Field. After the discovery of Prudhoe, the U.S. Geological Survey estimated that this reserve could contain as much as 10 to 33 billion barrels of oil. Due to long lead times to develop these reserves and the lack of transportation facilities to refineries, no oil could be obtained from NPR-4 in the event of an emergency during the 1974-1978 period.

In connection with the evaluation of the restricted production alternates for maintaining emergency standby supplies, an analysis was made of the cost for providing supplies from NPR-1. The field currently has the capability of producing 95 thousand barrels per day and delivering 35 thousand barrels per day to refineries through existing pipelines. To achieve maximum effectiveness as an emergency supply, it will be necessary to develop the field to its indicated MER of 267 thousand barrels per day at an initial cost of $69 million for wells and facilities and to provide additional pipeline capacity at a cost of at least $25 million to move oil from Elk Hills to Los Angeles refining centers. This work could be completed by mid-1975 and the field shut in for 20 years until the emergency supplies are assumed no longer needed. The total present value cost of this alternative is $7,100 per barrel of emergency supply per day. This is based on an interest rate of 7 percent and the price assumptions discussed previously.

The total present cost of restricted production from NPR-1 is quite high and, in addition, the MER rate of 267 thousand barrels per day is relatively insignificant compared to the total level of imports and to the level of import interruption considered in this study. This indicates that a more effective use for this reserve would be to produce it at capacity to minimize the impact of filling storage, which is a much less expensive emergency supply alternative on domestic supplies.

NPR-4 on the North Slope, although it currently has no standby producing capacity, is considered to have substantial reserve potential. However, this potential cannot be developed within the time frame under consideration (1974-1978). Although it might be developed to provide emergency capacity at some future date, economics indicate that this would be a very high cost means of protection. This is particularly true considering the remote, high cost location of this area and the logistical problems associated with moving any standby production to market. Ultimately, the only effective protection against an import interruption or a long-term supply shortage is to develop maximum energy self-sufficiency. These considerations suggest that NPR-4 has little value as an emergency reserve. They indicate that the NPR-4 acreage should be leased so that it can be developed to increase domestic energy supplies.

IMPLEMENTATION OF EMERGENCY STORAGE PROGRAMS

It is beyond the scope of this progress report to address such questions as the total volumes of storage required in an emergency reserve system, the mix of crude and products to be stored, the location of the storage, and the mix of underground and aboveground storage. However, the comparative total costs and initial investments for the various storage options permit some observations.

Any emergency system is likely to consist of a combination of aboveground and underground storage. Although salt dome storage is less costly, logistical considerations in many cases may dictate the use of steel tankage. Underground storage, particularly in salt domes, is uniquely adapted to large volume storage applications and would be particularly useful for strategic storage (i.e., storage reserved strictly for defense purposes and is not a part of working inventory). The flexibility to use salt dome storage as a part of working storage is somewhat limited due to the physical location of salt domes. However, through the selection of proper locations in the vicinity of planned deepwater terminals and various crude and product pipelines to the Midwest and East, the flexibility of salt dome storage can be greatly enhanced. Other methods of underground storage such as mined caverns and abandoned mines may also find application where local conditions and logistical considerations are favorable.

The cost of constructing and filling the large volumes of storage which could be required will be very substantial. The financing of a program of this magnitude and the problem of obtaining supplies to fill the storage require that careful planning and detailed study precede the establishing of requirements for any emergency storage system.

Appendices

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

DEC 5 - 1972

Dear Mr. True:

The United States is in a period of rapidly increasing dependence on imported petroleum. Associated with this dependency is the high risk involved to the Nation's economic well-being and security in the event these needed, imported energy supplies are interrupted for any reason. With such an alarming trend it becomes mandatory that the Nation's emergency preparedness program to insure supply of petroleum be improved without delay.

Over the past years, the Council has provided the Department of Interior with many outstanding studies which have contributed directly to preparedness for a national emergency. The Council's recent comprehensive energy outlook study indicates national policy options which will minimize dependence on imported petroleum over the long term. However, the study does not examine and evaluate alternatives, possible emergency actions and the results of such actions in the event of a temporary denial or marked reduction in the volume of imported petroleum available to the Nation during the next few years ahead.

The Council is therefore requested to make a comprehensive study and analysis of possible emergency supplements to or alternatives for imported oil, natural gas liquids and products in the event of interruptions to current levels of imports of these energy supplies. Where possible, the results of emergency measures or actions that could be taken before or during an emergency under present conditions should be quantified. For the purpose of this study only, assume that current levels of petroleum imports to the United States are reduced by denial of (a) 1.5 million barrels per day for a 60-day period, and (b) 2.0 million barrels per day for a 90-day period.

Of particular interest are supplements to normal domestic supply such as: the capability for emergency increases in production, processing, transportation and related storage; the ability to provide and maintain an emergency storage capability and inventories; interfuel substitution or convertibility of primary fuels in the major fuel consuming sectors; side effects of abnormal emergency operations; gains in supply from varying levels of curtailments, rationing and conservation measures; gains from temporary relaxation of environmental restrictions; as well as the constraints, if any, imposed by deficient support capability if an extraordinary demand occurs for manpower, materials, associated capital requirements and operating expenses due to emergency measures.

Such studies should be completed as soon as practicable, with at least a preliminary report presented to me by July 1973.

Sincerely yours,

Hollis M. Dole

Assistant Secretary of the Interior

Mr. H. A. True, Jr.
Chairman
National Petroleum Council
1625 K Street, N. W.
Washington, D. C. 20006

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer to:
MOG

JAN 22 1973

Dear Mr. True:

In our letter to you of December 5, 1972, we asked that the National Petroleum Council make a comprehensive study and analysis of possible emergency supplements to or alternatives for imported oil, natural gas liquids and products in the event of interruptions to current levels of imports of these energy supplies. We are pleased that the Council has agreed to undertake this study.

Our request letter set out several assumptions regarding petroleum supply levels which we now believe require clarification. Rather than assuming a reduction in petroleum imports to the United States of (a) 1.5 million barrels per day for a 60-day period, and (b) 2.0 million barrels per day for a 90-day period, it would be more useful to assume a denial of (a) 1.5 million barrels per day for 90 days, and (b) 3.0 million barrels per day for a period of 6 months. It is anticipated that the Committee will consider the current and predicted mix between crude and product imports in determining the impact of the assumed denials.

We wish to reaffirm that a preliminary report should be submitted by July 1973.

Sincerely yours,

Secretary of the Interior

Mr. H. A. True, Jr.
Chairman
National Petroleum Council
1625 K Street, N.W.
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