

INTERIM REPORT OF THE
NATIONAL PETROLEUM COUNCIL'S
COMMITTEE ON UNDERGROUND STORAGE
OF PETROLEUM PRODUCTS
October 31, 1951

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INTERIM REPORT OF NATIONAL PETROLEUM COUNCIL'S COMMITTEE

ON UNDERGROUND STORAGE OF PETROLEUM PRODUCTS

To: Chairman, National Petroleum Council

There has been no meeting of the full Committee on Underground Storage of Petroleum Products because the subject was considered to be essentially technical. Instead, the members of the committee were asked to make available persons from their organizations qualified to study and report on the technical phases. Those who were in a position to do so responded, and a Technical Subcommittee was organized as shown below.

CHAIRMAN

B. F. Hake
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GROUP I - PRODUCTION

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GROUP II - EXPLORATION

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GROUP III - REFINING

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GROUP IV - TRANSPORTATION AND SUPPLIES

M. E. Foster (Group Leader)
Phillips Petroleum Company
Bartlesville, Oklahoma

The first meeting of the Technical Subcommittee was held in Houston, Texas, on October 1 and 2, 1951. A second meeting is tentatively scheduled for January 14 and 15, 1952, in New York.

The objective assigned to this committee was a broad one. We felt that without some clarification, it might involve us in a protracted study, therefore, a letter requesting clarification was sent to Mr. James V. Brown, Secretary, National Petroleum Council. For general information, I have included excerpts of our letter addressed to Mr. Brown, and excerpts of the letter received from Mr. Hugh A. Stewart, Acting Director, Oil and Gas Division, U. S. Department of the Interior, in reply.

EXCERPT OF LETTER - N.P.C. COMMITTEE ON UNDERGROUND STORAGE
MR. JAMES V. BROWN, SECRETARY, NATIONAL PETROLEUM COUNCIL
DATED AUGUST 27, 1951

"The objective of the Underground Storage Committee, as set forth in Mr. Hallanan's letter of May 23, 1951, was to "make a study on the feasibility of the use of underground storage for petroleum products, including liquefied petroleum gases." This objective can be given a very broad interpretation and might result in a great deal of information being developed that would be of no real value. For instance, to state that a certain type of underground storage is "feasible" without knowledge of the kinds of products, in what quantities, where needed, and under what operating conditions, would be extremely shortsighted on our part and might lead to some very unfortunate conclusions.

"We have listed below those aspects of the problem we feel must be cleared up before we can intelligently complete our study. Will you please give us the benefit of your thinking on these points.

1. "By 'petroleum products' is it intended that crude oil and natural gas be included?
2. "How much underground storage capacity would be necessary and in what areas?
3. "What type of products will be stored underground?
Are they to be -
 - a. Finished, ready for use.
 - b. Blending components.
 - c. Raw material for use as charging stock.
4. "Are the stored products required to meet quality standards for -
 - a. Military usage.
 - b. Civilian usage.

5. "What operating conditions are planned? Is this storage to be working with frequent deposits and withdrawals, or is it to be dormant except in case of extreme emergency?"
6. "Many possibilities for underground storage exist in mines, caves, and other cavities that normally are not involved in the production of petroleum and, consequently, the oil industry would not be qualified to advise on their use. Is it intended this study cover such matters even though it will be necessary to request assistance outside the oil industry?"

EXCERPT LETTER - U.S. DEPARTMENT OF INTERIOR - HUGH A. STEWART
TO MR. JAMES V. BROWN, SECRETARY, NATIONAL PETROLEUM COUNCIL
DATED SEPTEMBER 4, 1951

"The petroleum products to be considered should be gasoline, kerosene, distillate, residual fuel oil, and should include liquefied petroleum gases.

1. "Petroleum products" refers to products derived directly from petroleum, including liquefied petroleum gases, but does not include crude oil or natural gas.
2. "Various studies indicate that 100 million barrels of storage capacity should be set as the goal.
 - (a) "Location of storage should be in or adjacent to large market areas, thereby 'storing' transportation as well as products.
3. "Products stored should be finished and ready for use.
4. "For this study stored products should meet qualified standards for civilian usage.
5. "Storage should be considered substantially dormant, but if or where practical, it might be made subject to periodical turnover to reduce deterioration.
6. "All practical types of underground storage should be considered. The petroleum industry today is adding additional tankage to the extent that steel is available and apparently is willing to build even more. Consideration of underground storage in which limited amounts of scarce materials would result in large storage capacity would prove interesting and valuable.

- (a) "Artificial chambers, enlarged by circulating fresh water in wells drilled into salt beds, are apparently now feasible for storage of liquefied petroleum gases. The study should indicate to what extent similar storage would be feasible for petroleum products. Likewise, it may be feasible to use abandoned salt mine or other underground mine cavities."

RESUME OF THE REPORT OF THE TECHNICAL SUBCOMMITTEE

In the light of Mr. Stewart's letter defining the scope of this study, the Technical Subcommittee reached the following tentative conclusions:

- (1) The underground storage of petroleum products, including liquefied petroleum gases, appears to be feasible subject to study on an individual site basis of contaminates, and further subject to unpredictable irregularities of geological formations.

These conclusions are largely based on study of actual projects where underground storage has been created for the purpose of storing the peak seasonal volumes of propane and butane.

- (2) The types of underground formations that seem to be most practical, based on cost, dependability, and general availability for the creation of underground storage, are salt beds and salt domes. Artificial caverns can be created in these formations by circulating fresh water and withdrawing the saturated brine.

Since salt formations offer the greatest possibilities for underground storage, the committee decided to concentrate on that phase of the study initially. Other types of storage, such as natural caverns, mines, and shale formations, will be investigated at a later date.

The availability of salt formations has been shown on the map of the United States which has been attached to this report (Exhibit A). It can be readily seen that these formations are reasonably close to areas of large consumption - a requirement stipulated in the letter from Mr. Stewart.

- (3) Whereas it is impossible to estimate, from available information, the total amount of storage that could be provided, it is safe to state that amounts considerably in excess of the 100,000,000-barrel goal, as set by Mr. Stewart, could be made available in salt formations alone.

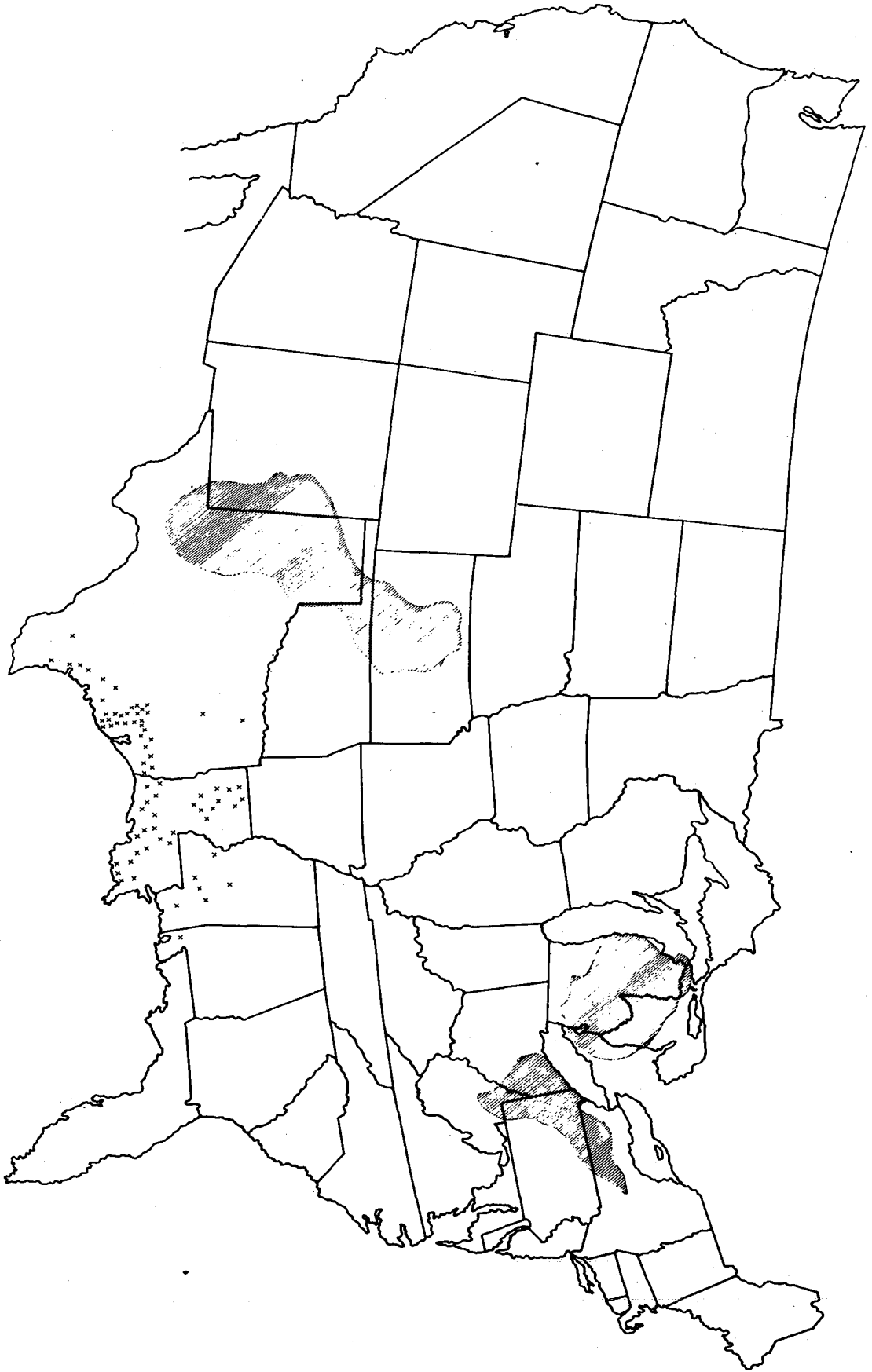
An incomplete survey of salt mining companies indicates that a considerable amount of storage might be made available by merely rehabilitating existing chambers.

- (4) Two important reasons for undertaking this study were (a) to find ways of protecting petroleum supplies against enemy attack, and (b) to save steel normally used for petroleum storage. Attached to this report is a graphical analysis (Exhibit B) showing that considerable savings in manpower and steel can be made if underground storage were used in place of above-ground tankage.

I wish to emphasize that the above are tentative conclusions of the Technical Subcommittee and should not be considered as representing the opinions of the full Committee.

The Technical Subcommittee will continue its study, enlisting such assistance from other sources that might be available. A second meeting has been scheduled for January of 1952 and we hope, at that time, to be able to present a more comprehensive report.

H. S. M. Burns
Chairman

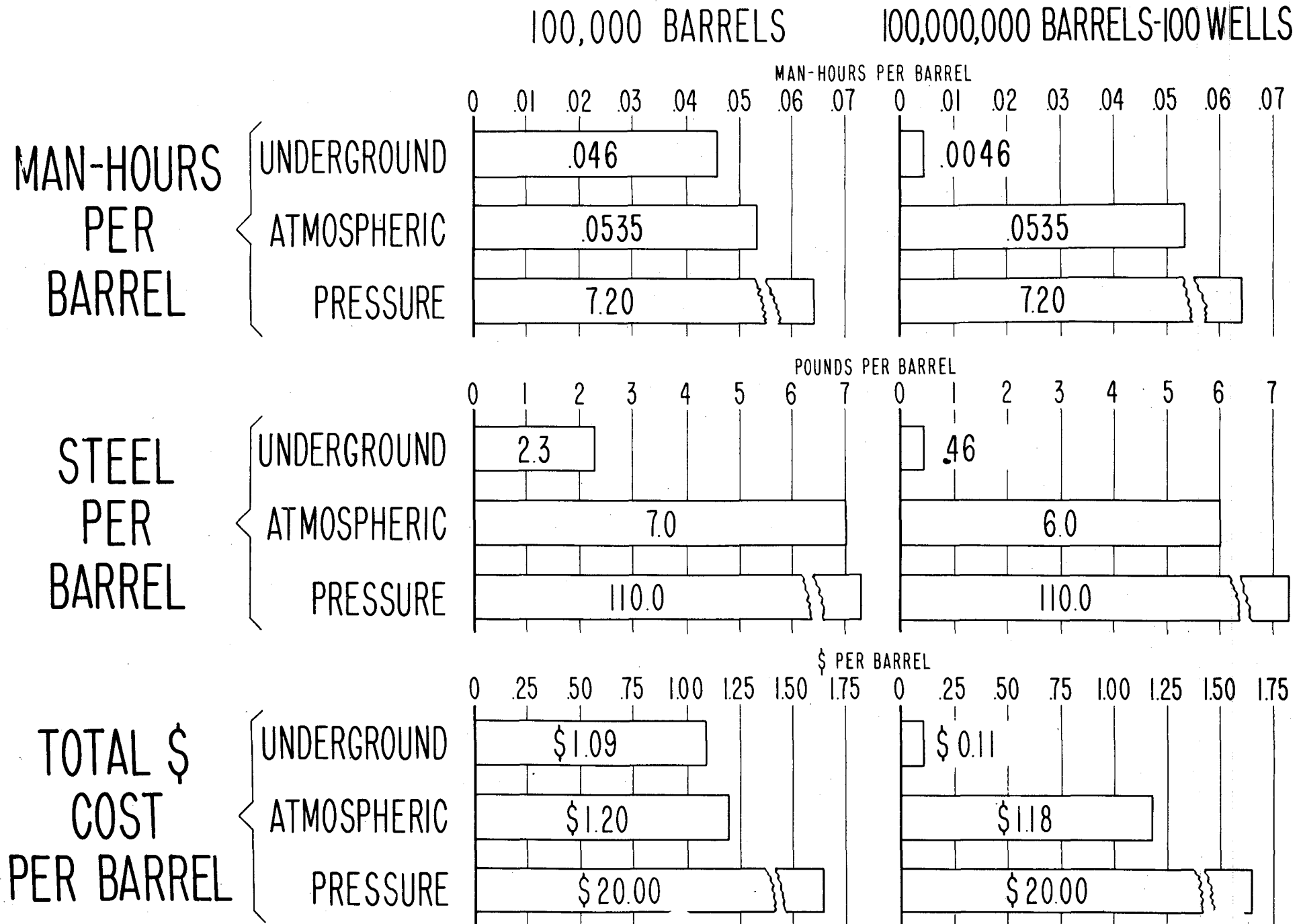


UNDERGROUND SALT BEDS AND DOMEES

LEGEND
SALT BEDS
SALT DOME x

EXHIBIT A

COMPARISON OF VARIOUS TYPES OF STORAGE



UNITED STATES
DEPARTMENT OF THE INTERIOR
OIL AND GAS DIVISION
Washington 25, D. C.

C
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Y

May 8, 1951

Mr. Walter S. Hallanan, Chairman
National Petroleum Council
1625 K Street, N. W.
Washington, D. C.

Dear Mr. Hallanan:

It would be of material assistance to Government to have an authoritative study on the feasibility of the use of underground storage for petroleum products including liquefied petroleum gas. Such storage would reduce the steel requirements of the industry, would make available to the industry additional storage capacity during this period of materials shortages, and would be less vulnerable to enemy attack.

It is, therefore, requested that the National Petroleum Council study the feasibility of underground storage for petroleum products and submit such report and recommendations with respect thereto as it may deem appropriate.

Sincerely yours,

/s/ H. A. Stewart

H. A. Stewart
Acting Director