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Dear Mr. Chairman:

In our February 2, 1970, meeting with you, Mr. Edmondson, and Mr. Burton, we discussed the January 23, 1970, comments of the Department of the Interior on our report on the review of the Government's helium conservation program, dated September 10, 1969 (B-114812).

Our report pointed out that significant changes have occurred since the Bureau of Mines' present helium program was authorized by the Congress in 1960 and that, in light of these changes, your Committee may wish to reappraise the basic concept and size of the program.

To demonstrate the effect that these changes have had on the Government's program, the report presented a comparison of actual operations through fiscal year 1969 with those anticipated in 1963 when the program was initiated. In addition, to furnish some indication of the future effect that these changes could have on the Government's helium program, the report compared the Bureau's long-range storage and funding projections prepared when the program was undertaken with projections developed by us in 1969 on the basis of data obtained from Bureau records.

The comparisons were presented to demonstrate the report's basic premise that, because of recent changes, the volume of helium that may be stored by 1986, as well as the related costs, may become substantially larger than initially anticipated.

The Department, in its comments to the Committee, indicated that, if these 1969 estimates of helium sales should materialize, the helium storage and program indebtedness would be as presented in the report. It expressed the belief, however, that reliable estimates of helium requirements over long periods of time are uncertain. The Department took the position that the helium conservation program could be self-liquidating by 1997. This position was primarily based on the assumption that the Federal helium requirements--as estimated

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by the Bureau of Mines in September 1969 on the basis of information furnished by the user agencies--will materialize and will be obtained from the Bureau.

In our discussions with you, we pointed out that the Department's estimate of program liquidity by 1997 hinged on estimates of the future helium requirements of the National Aeronautics and Space Administration. It was agreed that we would make limited inquiries into the reasonableness of the basis of the Department's 1997 estimate, especially as it applies to requirements of the National Aeronautics and Space Administration.

We believe that the basis for the Department's estimate is not sufficiently adequate to provide reasonable assurance that the helium program indebtedness will be liquidated by 1997. We agree with the Department that long-range projections of this nature are very difficult to make. The most crucial issue concerns the projection of Bureau sales, most of which are expected to originate with the National Aeronautics and Space Administration. Variables--such as the user agencies' future annual funding levels, changes in user agencies' programs, and technological changes--could materially affect Bureau sales. In our opinion these uncertainties, when added to the lack of program planning by the user agencies over the entire period of the Department's projections, preclude accurate long-range projections of Bureau sales.

Our detailed comments on these and other matters are set forth in the enclosure to this letter.

We have not furnished copies of this report to the Department of the Interior or to others, but we have notified Department officials of the subject matter of this report and the date of its release. We plan to make no further distribution of this letter unless copies are specifically requested, and then we shall make distribution only after your agreement has been obtained or public announcement has been made by you concerning the contents of the letter.

If we can be of further assistance to you, please do not hesitate to call on us.

Sincerely yours,

Comptroller General
of the United States

Enclosure

The Honorable Wayne N. Aspinall, Chairman
Committee on Interior and Insular Affairs
House of Representatives

GENERAL ACCOUNTING OFFICE

COMMENTS ON FOLLOW-UP REVIEW

OF THE GOVERNMENT'S HELIUM PROGRAM

The General Accounting Office has examined into certain aspects of the Government's helium conservation program administered by the Bureau of Mines, Department of the Interior. This limited review was made as a result of a February 2, 1970, meeting with Mr. Wayne N. Aspinall, Chairman of the House Committee on Interior and Insular Affairs; Mr Ed Edmondson, Chairman, Subcommittee on Mines and Mining; and Mr. Laurence J. Burton, member of Congress.

In this meeting, we discussed the January 23, 1970, comments of the Department of the Interior on our report on the review of the Government's helium conservation program, dated September 10, 1969 (B-114812). The Department, in its comments, expressed general agreement with the report, although differing with certain specific matters discussed in the report.

The more significant differences are the subject of this follow-up review, and our observations on these matters follow.

BUREAU'S REVISED PAYOUT SCHEDULE

The Helium Act Amendments of 1960 (50 U.S.C. 167) require that sales of helium by the Secretary of the Interior be at prices established by him to cover certain investment and plant costs and all costs incurred in carrying out the provisions of the act and to repay to the U.S. Treasury, within 25 to 35 years from the date of enactment, all funds borrowed together with interest thereon. The Bureau prepared a payout schedule, dated September 23, 1969, which indicates that the debt to the Treasury for the helium program will be liquidated during fiscal year 1997.

This schedule includes projections by fiscal year from 1970 to 1997 of the factors affecting program payout. A

brief description of the factors considered in the Bureau's projections are as follows:

Volume of sales--Estimates made by the Bureau on the basis of data submitted to the Bureau in August and September 1969 by the user Federal agencies.

Volume of purchases--Estimates prepared in 1963 of the contained helium to be delivered to the Bureau under long-term contracts entered into in 1961 with four private companies.

Expenditure for helium purchases--The estimated volume of purchases at $12 per thousand cubic feet (MCF) of contained helium.

Cost of operations--A constant $8 million annual expenditure for all program costs except helium purchases.

Total income--The estimated volume of sales at $40 per MCF--the $35 sales price for helium plus $5 for estimated income from services and other sources.

Interest--Estimated outstanding program debt to the Treasury at 6-percent interest.

Our limited inquiry indicated that the Bureau's projections do not provide reasonable assurance that the helium programs indebtedness will be liquidated by 1997, because:

--the estimated volume of sales to the National Aeronautics and Space Administration (NASA) is questionable (see p. 5),

--the estimated cost of purchases does not provide for cost escalations (see p. 8),

--the estimated cost of operations would be significantly understated if income from services and other sources should materialize (see p. 10).

Sales volume and income

Bureau records show that in June 1969 the Director of the Bureau of Mines requested each of the Federal helium-using agencies to submit estimates of their future helium needs through year 2000. On the basis of data submitted by the user agencies, the Bureau estimated the helium requirements of all Federal agencies for the period 1970 through year 2000 to be 46,550.4 million cubic feet (MMCF) of which NASA requirements would be 42,450 MMCF.

NASA is the principal Federal agency user of helium, and we made a limited inquiry into the basis of its forecasted requirements. Officials of the NASA Office of Facilities advised us that no documentation had been prepared in support of the NASA forecast, that the forecast had been based essentially on their knowledge of NASA's future programs, and that they had obtained the advice of officials responsible for carrying out the various programs as to their estimated helium needs.

NASA forecasts of helium requirements furnished in August 1969 to us and to the Department of the Interior have been revised because of recent NASA budget cuts. A comparison of NASA's August 1969 estimate with its revised estimate of annual helium requirements is presented in the following table.

	1970-72	1973-75	1976-80	1981-90
	(billion cubic feet)			
August 1969 forecast	.3	.5 to .6	1.0 to 1.15	1.3 to 1.4
Revised forecast	.15	.34 to .5	.7 to 1.0	1.0 to 1.6

The revised estimated minimum and maximum requirements are less than those of the August 1969 estimates for the period 1970 through 1980, and there is a greater variance between minimum and maximum requirements for the period 1981 through 1990.

NASA agrees that many unpredictable factors are involved in determining NASA's helium requirements, such as the amount

of appropriations for NASA's programs, but expects NASA's budget to gradually increase as the Government's involvement in Vietnam is lessened. NASA's August 1969 forecast of helium requirements for the period 1976-80 is based on an annual budget level of about $7 billion, compared with the current request of $3.3 billion for fiscal year 1971. Further, the 1.3 to 1.4 billion cubic feet forecasted annual requirement for the period 1981 to 1990 is based on potential developments that have not been translated to a specific budgetary level.

NASA's forecast of helium requirements is based primarily on an integrated space flight program for the next two decades which was presented to the Senate Committee on Aeronautical and Space Sciences in the fall of 1969. This program covers a period from 1970 to 1990. We were advised that NASA could not forecast its helium requirements beyond 1990 on the basis of a planned program and that it was reluctant to speculate what these helium requirements might be. In response to the request from the Director, Bureau of Mines, for NASA to estimate its helium requirements through the year 2000, the Director of Facilities, NASA, by letter dated August 5, 1969, to the Director of the Bureau of Mines, stated:

> "Attached is a forecast of NASA requirements for helium through year 1990, in response to your request of June 19, 1969. We did not feel that we had sufficient visibility to extend this forecast through year 2000 as requested. However, assuming the programs cited in our forecast are successfully pursued, one would expect the 1990-2000 helium consumption to be approximately 25 to 50 percent above the levels of the previous decade."

NASA officials characterized NASA's forecast of helium requirements to us as being conservative as to the amount of helium needed for each specific planned program but indicated that it would be optimistic to expect all programs to materialize as planned.

We could not review NASA's forecast of its helium requirements because of the lack of supporting documentation and because a meaningful review of the forecast would also

entail a review of NASA's planning of its 20-year integrated space program on which, we were advised, the forecast had been based. However, during our limited inquiry, we noted the following matters regarding the forecast, which make its reliability appear questionable as a basis for program planning.

1. The Bureau's projection of NASA's helium requirements beyond 1990--2,000 MMCF annually--is 13 times greater than NASA's current requirements--150 MMCF annually; in addition, it is in excess of 90 percent of the total annual Government helium requirements of about 2,130 MMCF during that period. Accordingly, the realization of this large increase in Bureau sales to NASA is critical to achieving program liquidity by about 1997, as estimated by the Department in its January 23, 1970, comments to the Committee.

   The reliability of such critical long-range projections appears questionable because NASA has not planned specific programs nor forecasted its helium requirements beyond 1990.

2. NASA's estimating its future helium requirements through 1990 without detailed analysis and documentation indicates that its forecasted long-range helium requirements may not have been developed nor studied in sufficient detail to provide an adequate basis for the Bureau's long-range projection that the helium program will be self-liquidating.

3. The Bureau, in projecting the future helium requirements of Federal agencies, has used the maximum annual helium requirements estimated by NASA even though NASA's forecast optimistically included the requirements of all planned programs.

4. NASA's estimated helium requirements for the period 1970 through 1972, provided to the Bureau in August 1969, have already been revised downward by 50 percent.

5. If the Bureau's projected requirements for NASA should materialize, information obtained from the Bureau suggests that the Government's cost for pure helium would increase. This increase would result in making helium recovery and repurification systems more attractive to NASA, and the development of such systems would curtail NASA's need to obtain pure helium from the Bureau.

   A Bureau of Mines official told us that the existing Bureau purification plants do not have the capacity to purify sufficient helium to meet estimated annual Government helium demand after 1975 if the current Bureau estimates materialize. He told us also that, for the Bureau to meet annual needs after 1975, it would have to either expand its purification capabilities or let private industry purify the Government's crude helium. (See p. 11.) In either event the overall cost to the Government for pure helium would be greater than the current cost of about $11 per MCF.

Cost

The entire cost of the Bureau's helium program--production, sales, conservation, and research--is financed from its Helium Fund. Two categories of cost included in the Bureau's September 1969 payout schedule were purchase costs and costs of operations.

A Bureau official told us that purchase costs are the estimated expenditures for crude helium purchases from the four Government contractors--Northern Helex, Inc.; Cities Service Helex, Inc.; National Helium Corporation; and Phillips Petroleum Company. The purchase costs were computed on the basis of $12 per MCF for the volume of contained helium that the Bureau forecasts will be delivered to the Government annually by the four contractors during the remaining life of the contracts.

Costs of operations consist of the costs of production, marketing, resources survey, research, and administration and all other costs except the purchase costs. The Bureau's payout schedule is based on a forecast of constant annual operating costs of $8 million from 1970 through 1997.

Purchase costs

Under provisions of the Helium Act Amendments of 1960 (50 U.S.C. 167), the Bureau entered into 22-year fixed-unit-price contracts with four private companies for the procurement of crude helium (a helium gas mixture having a helium purity between 50 and 80 percent) extracted from natural gas. The contracts provide that the initial fixed unit prices be subject to adjustment each year on the basis of changes in the industrial commodities price index and/or in the weighted average price of natural gas delivered to the contractors. Each of the contracts also provides for a maximum annual payment, and the total maximum annual payment to the four contractors for deliveries is $47.5 million.

The Bureau's September 1969 payout schedule included the estimated expenditure for crude helium purchases which was computed on the basis of $12 per MCF of contained helium expected to be supplied annually by the four Government contractors during the remaining life of the contracts. The

Bureau's September 1969 payout schedule shows that an estimated $486 million will be required for payments to the helium conservation contractors for deliveries of 40.5 billion cubic feet of helium during the period fiscal year 1970 through fiscal year 1983 when all of these contracts will expire.

We believe that the Bureau's estimated cost of $12 per MCF of helium deliveries over the remaining life of the contracts may be understated because escalation was not provided for in the Bureau's payout schedule.

The Acting Assistant Director, Helium, told us that in fiscal year 1969 the actual average price of the helium purchased from the four contractors was $11.93 per MCF. Therefore, the Bureau's estimates essentially did not provide for future price escalations. We believe that this may not be reasonable in view of the price increases experienced since inception of the program and the lack of any indications that similar increases might not be experienced in the future.

A history of the helium purchases by the Bureau under the conservation contracts is shown below.

Fiscal year	Volume MMCF	Cost (000 omitted)	Average cost per MCF
1963[a]	317	$ 3,360	$10.60
1964	2,622	29,289	11.17
1965	3,270	36,781	11.25
1966	3,599	40,801	11.34
1967	3,582	41,298	11.53
1968	3,603	42,336	11.75
1969	3,575	42,651	11.93

[a]This was the first year when deliveries were made and only three of the four contractors made deliveries. The initial unit prices, established during negotiation, were included in the contracts awarded during the last half of calendar year 1961.

The average unit prices paid for helium have increased steadily over the first 7 years of operations under the contracts. From fiscal year 1964 (the first year in which all contractors made deliveries) through fiscal year 1969, the average unit price of helium delivered increased by 76 cents, or about 7 percent, primarily as a result of increases in the wholesale price index for all commodities exclusive of farm products and food, which serves as a basis for annual adjustment of each of the contract prices. As shown in the following table, this wholesale price index has significantly increased over the last 34 years. It therefore seems reasonable to expect that the unit price of helium paid to the contractors would increase over the remaining term even if not at the same rate at which it increased previously.

Year	Wholesale price index
1935	44.0
1940	46.8
1945	56.3
1950	82.9
1955	92.4
1960	101.3
1965	102.5
1969	112.7

On the basis of deliveries during the prior years and the first half of fiscal year 1970, we estimate that the average price for the helium purchased would be about $12.20 per MCF, or 20 cents per MCF more than the Bureau used in its September 1969 payout schedule and nearly 30 cents more than the average price paid in the prior year. This would require payments to the contractors totaling $43.1 million for fiscal year 1970 helium deliveries, or $1.8 million more than projected by the Bureau in its September 1969 payout schedule.

Cost of operations

The Bureau's September 1969 payout schedule was based on a constant annual operating cost of $8 million (all helium program costs other than the costs for the purchase of crude helium and for interest). The Acting Assistant Director, Helium, told us that this estimate was based on his judgment

of the funds needed for program operations. He told us also that the estimate of the annual operating cost of $8 million was made without giving consideration to potential annual savings expected to result from the Bureau's decision to discontinue its helium research program ($1 million) and from modernization of one of the Bureau's plants ($.9 million).

The Bureau's operating cost has been about $8 million to $9 million in recent years. If the Bureau continues operations of its existing facilities and provides services at about the current level, and realizes the potential savings mentioned above, the estimated annual operating cost of $8 million appears to be reasonable and a figure that would provide for cost increases that could be expected to occur during the next 28 years.

If the Bureau's forecasted income from services and other sources materializes, the associated costs to produce this income, which are part of the operating costs, have not been adequately forecasted, and program costs may be materially understated.

The Bureau, in forecasting that the helium program could be self-liquidating by 1997, has estimated that, for each MCF of helium sold, the Bureau will receive income of $5 from services and other sources. The Bureau expects this income to come principally from rentals of containers and from other charges relating to the transportation of helium from the Bureau facilities to the helium user. It is Bureau policy to provide these facilities and services on a full-cost-reimbursement basis.

In 1969, income of $2.1 million was derived from services and other sources, including income of $1.6 million from container rentals and other charges related to helium transportation. The expenses related to this income amounted to $1.7 million.

The estimated income of $5 per MCF from services and other sources, included in the Bureau's projection, increased from $2 million in 1970 to $10 million in 1991. Since this income for the most part is in reimbursement of costs, it appears that the costs related to this income will also increase substantially. We were advised by a Bureau official that

existing facilities and capabilities would require expansion before these increased revenues could be achieved. The Bureau, however, has based its payout schedule on a constant annual operating cost of $8 million, most of which relates to the cost of operating the Government's helium production facilities rather than to the reimbursable operations.

For the period 1970 through 1997, the Bureau has forecasted total income of $200 million from services and other sources and total cost of operations of $224 million. The current annual operating cost ($9 million in 1969) is principally attributable to the operations of the Bureau's purification and production facilities. If the Bureau continues to operate these facilities, the related costs will account for the major portion of the estimated operating cost of $224 million. It appears, therefore, that the Bureau has not provided for the necessary costs that can be expected to be incurred in obtaining the increased revenues from services and other sources.

Bureau's capability to meet demand forecast

The Bureau's September 1969 payout schedule is based on a forecasted sales increase during the period 1970 through 1997. However, we do not believe that the Bureau has existing capability to purify helium at the forecasted demand level or that it has specifically included any provision for increasing the Bureau's capabilities.

The January 23, 1970, comments of the Department of the Interior to the Committee, on the General Accounting Office (GAO) report, pointed out that the total capability of the Bureau's Exell and Keyes plants is about 750 MMCF a year. The Bureau's forecasted demand will exceed this capability by 1976. The Acting Assistant Director, Helium, advised us that, if it appears that the forecasted helium requirement will in fact materialize, the Government may consider two alternatives--one would require expanding Bureau facilities to meet the expected demand and the other would provide for private industry to purify a portion of the crude conservation helium to meet the demand.

Either alternative would result in an increase in the overall cost to the Government. If the first alternative were selected, the additional cost would be incurred by the Bureau, which would increase its cost of operations; however, under the second alternative the user-agencies might incur the additional purification cost.

OTHER MATTERS

On page 2 of the Department's comments to the Committee, reference was made to the GAO report comment that a 1967 Bureau report showed that, if the Bureau's Exell and Keyes plants were to purify conservation helium in addition to crude helium extracted from natural gas, the two plants could purify a total yearly capacity of 1 billion cubic feet. The Department pointed out that the report referred to by GAO was accompanied by comments from the General Manager, Helium Operations, that achieving such capacity operation was unlikely because it involved operating at 100-percent load factor for 365 days each year.

The comments of the General Manager, Helium Operations, did not accompany the copy of the report made available to us in our review and we therefore did not have the benefit of his views. Regarding the estimated purification capacities of the two Bureau plants, the 1967 report stated that "Allowance has been made for routine maintenance and downtime due to equipment failure."

Our basic message concerning this matter was to point out that production from the Bureau plants exceeded Bureau sales and that the excess production had been placed in the Cliffside storage reservoir. This situation, which was not contemplated when the helium program was initiated, has contributed to the Bureau's financial problem and has increased the amount of helium being placed in storage. We pointed out that, because of the limited time available for our review, we did not examine into the feasibility of cutting back production of pure helium and that the Committee may wish to explore this matter. This was one of three possible alternatives suggested to the Committee for exploration if a decision was made that the helium program should be adjusted to approximate the size of the one contemplated initially in 1960.

Recent Bureau production statistics show that the pure helium production from either the Exell or the Keyes plant would have more than met the needs of Federal agencies during the 6-month period ended December 31, 1969. During this

period about 222 MMCF, of the 337 MMCF of helium purified in these plants, was placed in storage.

We recognize that (1) there must be adequate long-range planning in carrying out the Bureau's responsibility for supplying pure helium to meet current needs and that some lead time may be necessary to make a major revision in the Bureau's purification capabilities and (2) the Bureau has closed down two plants and plans to close down a third. Nevertheless, the Bureau is producing more helium than needed to meet current requirements, and we remain of the view that the Committee may wish to explore this matter with the Department.

We note that the Department has projected a significant increase in pure helium sales beginning in fiscal year 1973. If these projected sales should materialize, the full current Bureau production capability would soon be required, and the need for a cut-back in Bureau production would be negated. However, as indicated on pages 3 through 6 of this enclosure, we question the basis for the projected sales.