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Congressional Research Service

Report for Congress

The Federal Helium Program: The Reaction Over An Inert Gas

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SUMMARY

Helium, present in relatively high concentrations in only a few natural gas fields, is released to the atmosphere and wasted when the natural gas is burned as fuel. Government involvement in helium conservation dates to the Helium Act of 1925 which authorized the Bureau of Mines to build and operate a large-scale helium extraction and purification plant. From 1929 until 1960 the federal government was the only domestic helium producer. In 1960, Congress amended the Helium Act to provide incentives to natural gas producers for stripping natural gas of its helium, for purchase of the separated helium by the government, and for its long-term storage. With over 960 million cubic meters (34.6 billion cubic feet) of helium in government storage and a large private helium recovery industry, questions arise as to the need for either the federal helium extraction program or the federally maintained helium stockpile.

Amid controversy between Congress and the President over the Department of the Interior appropriations and the federal budget, the Bureau of Mines has been terminated. The budget battle has not been fought over the Bureau of Mines specifically, but it has become a casualty of the conflict. Several functions have been transferred to other agencies within the Department of the Interior or to other departments. (See Endnote 1.)

In a move which would take the federal government out of the helium business, Congress passed the Helium Privatization Act (H.R. 873) as part of the Seven-Year Balanced Budget Reconciliation Act of 1995 (H.R. 2491). Although the measure died when the President vetoed the Budget Act on December 6, 1995, the Administration has made a goal the privatization of the federal helium program. On April 30, 1996, the House suspended the rules and passed H.R. 3008, the Helium Privatization Act as agreed to in the House-Senate conference on the Budget Act. Subsequently, the Senate Energy and Natural Resources Committee amended the bill to provide for the National Academy of Sciences to study how best to dispose of the helium reserve. On September 26, 1996, with limited time remaining for the 104th Congress, the House again suspended the rules and passed H.R. 4168, a new bill containing the Senate Committee language. This would avoid the need for a conference if the Senate would also pass the same bill. The Senate did so on September 28, 1996. This report reviews the origin and development of the Federal Helium Program; analyzes the choices that Congress faced in terminating the program; reviews the issues that the National Academy of Sciences will study, and summarizes H.R. 4168.

BACKGROUND

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BACKGROUND

Helium is an inert gas with unique properties. It is used in large quantities in space, defense, and advanced energy systems. Its major uses include cryogenics in medical and superconductivity applications, cover gas in arc welding, and for pressurizing and purging fuel tanks and vessels in the space program. Other important uses include breathing gas mixtures for deep sea diving, controlled atmospheres for growing crystals for transistors, heat transfer mediums for nuclear power generators, leak detection, chromatography, and lifting gas. If temperatures below -429 F are required, there is no substitute for helium. Argon can be substituted for helium in welding and hydrogen for helium as a lifting gas if flammability is not a concern.

Federal interest in helium began with World War I when its military value as an inert lifting gas was recognized by the Army and Navy. The Bureau of Mines' involvement in the Helium Program dates back to passage of the Helium Act of 1925 under which the Bureau was authorized to build and operate a large-scale helium extraction and purification plant. This plant went into operation in 1929 at Amarillo, Texas. Demand increased significantly during World War II and four more plants were built, including the Exell, Texas plant, which is now the Bureau's only operating plant. Private helium operations followed passage of the Helium Act Amendments of 1960 (P.L. 86-777) which authorized the Secretary of the Interior (authority delegated to the Bureau of Mines) to enter into long-term contracts for the acquisition and conservation of helium to be stored in the Cliffside Reservoir near Amarillo, Texas. The Act directed the Secretary of the Interior to operate and maintain helium production and purification plants and related storage, transmission, and shipping facilities. The Act also authorized the Secretary to borrow from the Treasury up to \$47.5 million per year, at compound interest, to purchase helium in lieu of direct appropriations. The 1960 Act required the Secretary of the Interior to determine the net worth of assets of the Helium Program acquired prior to 1960 (\$40 million) and establish this as debt in the Helium Fund to which subsequent borrowing would be added. The Act stipulated that the Bureau of Mines set prices that would cover all of the program's costs, including debt and interest, and provided a period of 25 years to pay back the debt (with a 10-year extension to 1995). In addition, federal agencies and contractors were required to buy helium from the Bureau of Mines.

As a result of the 1960 Act, four private natural gas producing companies built five helium extraction facilities and entered into 22-year contracts with the Bureau of Mines. Because demand for helium did not meet the forecast of the late 1950s, the Bureau of Mines began to borrow from the Treasury as authorized to pay for helium purchases. In 1973, the government had 970 million cubic meters (35 billion cubic feet) of helium in storage, which was far in excess of projected government needs, and canceled the purchase contracts. This led to several years of litigation during which most private helium extraction plants remained idle.

Helium is a constituent of natural gas deposits ranging from a trace to about 8 percent by volume. Helium is also a minor constituent (0.0005 %) of the atmosphere. Most natural gas is burned as fuel without first recovering the helium. Consequently, much helium is lost to the atmosphere and diluted beyond effective recovery.

The helium resources of the United States are estimated to be about 13 billion cubic meters (470 billion cubic feet). This includes 1.0 billion cubic meters (34 billion cubic feet) in storage in the government stockpile, 6.8 billion cubic meters (250 billion cubic feet) in helium-rich natural gas (0.3% helium or more), and 5.2 billion cubic meters (190 billion cubic feet) in helium-lean natural gas (less than 0.3% helium). Other than the two major helium-rich natural gas fields (Riley Ridge in southwestern Wyoming and Hugoton extending from southwest Kansas through the Oklahoma and Texas Panhandles), most of the helium-rich natural gas fields in the United States will be exhausted by the year 2000. (See Endnote 2.) As these fields deplete, future production will probably shift to extracting helium from helium-rich natural gas with little fuel value and from helium-lean resources.

World helium resources exclusive of the United States are estimated at 18 billion cubic meters (650 billion cubic feet) of which 9.2 billion cubic meters are in the former Soviet Union, mostly in Russia. Other helium resources are located in Algeria, 2.1 billion cubic meters; Canada, 2.1 billion cubic meters; China, 1.1 billion cubic meters; Poland, 0.8 billion cubic meters; and the Netherlands, 0.7 billion cubic meters.

meters.

Prior to passage of the Helium Act Amendments of 1960, the only helium extraction plants in the world were those owned by the U.S. Bureau of Mines. The United States remains the world's major producer and consumer of helium, consuming approximately 72 million cubic meters and exporting 24 million cubic meters in addition. The United States exports over 4 times as much helium as is produced in all of the rest of the world. The total sales value of domestic consumption and exports of refined helium is nearly \$200 million of which the government produces less than 10%. Domestic production comes from the government helium extraction plant in Texas and twelve privately owned plants (five in Kansas, four in Texas, and one each in Colorado, Utah, and Wyoming).

ISSUES

The Bureau of Mines' helium production program began as an effort to assure the government of an adequate supply of helium at a time when there was no private helium production. Later, the program was amended to conserve helium by encouraging private helium extraction activities from natural gas through a government purchase and stockpile program in which authority was given to the Bureau of Mines to borrow from the Treasury for the purchase of helium, with the expectation that future sales would recover that loan. This borrowing authority was established in lieu of direct appropriations. The law required that the loan be repaid in 25 years, with subsequent extension of 10 years to 1995. Demand for helium did not meet expectations and interest rates rose well beyond the 3.75% forecast, consequently, the Bureau of Mines has not been able to repay Treasury for its helium purchase loan. Approximately \$252 million was issued under this borrowing authority. With interest, this indebtedness has now increased to about \$1.3 billion with no prospect for repayment in the foreseeable future under the present circumstances.

Since the mid-1980s, private consumption of helium has increased significantly and private production of helium is now thriving. In 1988, the Office of Management and Budget targeted the federal helium operation as an enterprise that belonged in the private sector, and sought authority to sell the federal helium extraction facilities. Congress opposed this.

Because helium is essentially a byproduct, the price is somewhat artificial. Thus, since the cost can be partially recovered through other products, private industry has generally set its price for helium below that of the federal government. In 1992, the Administration dropped its effort to sell the helium extraction facilities and proposed amending the Helium Act Amendments of 1960 to permit federal agencies to purchase helium from the private sector. In the meantime, the federal government increased its price for gaseous helium 46% to \$1.983 per cubic meter (\$55 per thousand cubic feet), effective October 1, 1991, f.o.b. Bureau facilities. At the same time, the Bureau's price for bulk liquid helium was raised to \$2.253 per cubic meter (\$62.50 per thousand cubic feet) until November 1, 1992, when it was raised again to its current price of \$2.380 per cubic meter (\$66 per thousand cubic feet), plus additional charges for container services and rent. Private industry's price for gaseous helium is now about \$1.802 per cubic meter (\$50 per thousand cubic feet). Government production of refined helium now amounts to less than 10% of the domestic production, a considerable decline from the 100% that it had been prior to 1960.

Currently, revenues exceed operating expenses of the federal helium extraction program by approximately \$10 million annually with revenues around \$33 million and outlays around \$23 million. Approximately 63% of the revenues will be federal funds from other agencies. These figures, however, do not include repayment of the funds borrowed from the Treasury on which interest has been compounding since the 1960s. When interest on this debt is accounted for, the net loss for the Helium Program in FY1995 was about \$38 million. In parallel fashion to the revenue side, however, this loss represents the government owing itself money.

Congress faced several choices. If Congress were to have retained the Helium Program and amended the Helium Act Amendments of 1960 to permit federal agencies to purchase helium from the private sector, at the current price structure, there would be a saving to the agencies and federal contractors, but a reduction in revenue and further loss for the Federal Helium Program. Under this scenario, if the government were to lower its price to remain competitive, the Program's debt would still increase more

government were to lower its price to remain competitive, the Program's debt would still increase more rapidly. According to the Bureau of Mines, their price represents the long-term replacement cost of helium and is based on the market price to which they add a premium of \$5 or more in order to discourage private purchases from the Bureau so that they do not compete with or jeopardize private producers. (See Endnote 3.) To cover operating expenses, the Bureau's cost of producing helium is \$37.50 per thousand cubic feet, which the General Accounting Office (GAO) points out is less than the price for which the government could purchase helium from private producers. (See Endnote 4.)

Another option that Congress considered was to amend the Helium Act Amendments to excuse the debt or some portion of it, such as the compounded interest on the funds borrowed originally. Legislative proposals incorporating this option were introduced.

The other major legislative option was to terminate the Helium Program, and sell the facilities and most of the stockpile. This is the option that Congress enacted. By authorizing the sale of the federal helium extraction facilities, future conservation of helium will be entirely dependent on the private sector. Private industry, however, produces helium only as a byproduct of natural gas processing and when the price or production of natural gas is low, helium production would likely be reduced or shut down. Industry's continued use of the Cliffside storage field for excess production and withdrawal could be helpful in this regard. Private industry currently has about 82 million cubic meters (3.0 billion cubic feet) of helium in storage in the Cliffside field.

By selling the stockpile and its helium extraction and refining facilities, federal needs could still be met through withdrawal of helium from storage with separate arrangements for refining. If all of the helium in the stockpile were sold, but reserved for repurchase to meet federal needs, at the current level of consumption, the supply would last between 80 and 100 years. This would also probably require provision in the sales authorization to establish some obligation on the part of the private purchaser to supply future federal helium requirements as needed. Without the government production price as a benchmark, however, there is no certainty that the purchase price of helium from private suppliers would be any lower than the cost at which the government could produce it and recover operating costs.

An additional concern is that sales of helium from the stockpile will displace helium that would otherwise be recovered from natural gas production, and helium that is not recovered from gas production will be lost to the atmosphere.

Another consideration is that approximately 190 employees are involved in the Helium Program, thus, its termination could reduce federal employment, resulting in a savings of about \$10 million annually.

Other questions related to termination of the Helium Program involve the cost of building new infrastructure to supply helium needs at the Kennedy Space Center, which consumes over 80 million standard cubic feet for Space Shuttle processing and launch requirements. This requires about 50 rail cars of gaseous helium for every Shuttle launch. Since industry primarily uses and transports liquid helium, gasification facilities at the Space Center would be needed. Estimates for the cost of these facilities are on the order of \$14 million to \$18 million.

Legislative Action. H.R. 3008, the Helium Privatization Act of 1996, passed the House of Representatives on April 30, 1996 by a vote of 411 to 10, and was sent to the Senate for consideration. This bill is identical to the House-Senate compromise Helium Privatization Act included in the Seven-Year Balanced Budget Reconciliation Act of 1995, which the President vetoed on December 6, 1995. Subsequently, the Senate Energy and Natural Resources Committee amended the bill to provide for the National Academy of Sciences to study how best to dispose of the helium reserve. On September 26, 1996, with limited time remaining for the 104th Congress, the House again suspended the rules and passed H.R. 4168, a new bill identical to H.R. 3008 but containing the Senate Committee language. This would avoid the need for a conference (for which there would not be time) if the Senate would also pass the same bill. The Senate did so on September 28, 1996.

Under the bill, the Secretary must cease producing, refining and marketing refined helium within 18 months after enactment. Recognizing the current market surplus, the bill allows flexibility in commencement of the sale of the stockpile. To minimize market disruption, sales may begin as late as

2005, but the stockpile must be eliminated by 2015. Although a longer termination period might be preferred, the President mentioned in the 1995 state of the Union address that the privatization of the federal helium program is a goal of his Administration.

The Helium Privatization Act of 1996 would require the stockpile of crude helium to be sold at a price determined by dividing the total debt of the helium program (about \$1.4 billion) by the volume of the crude helium in storage (about 32 billion cubic feet). This would yield a selling price of over \$43 per thousand cubic feet, which is over 25% higher than the current market value for crude helium. This value would establish the minimum acceptable bid, and sales revenue received from the private sector would be returned to the Treasury to complete payment of the helium debt. If sales from the helium stockpile began immediately, the average annual amount needed to be sold would represent over 20% of current consumption. If sales were delayed until 2005, the average annual amount that would need to be sold would represent over 40% of the current domestic consumption. Disposal of this volume of crude helium without market disruption would require rather favorable growth in the helium market.

In view of these and other concerns, the Act also requires the National Academy of Sciences (NAS) to study and report on whether the disposal of the helium reserve will have a substantial adverse effect on the helium industry, the U.S. helium market, or on U.S. scientific, technical, biomedical, or national security interests. With the aid of the NAS report, if the Secretary of the Interior determines that there will be a substantial adverse effect, the Secretary is to make recommendations for proposed legislation as may be necessary to avoid such adverse effects.

Endnotes

(1) See "Orderly Closure" of the Bureau of Mines: FY 1996 Funding by Duane A. Thompson, CRS Report No. 96-107 ENR, Jan. 1996.

(2) U.S. Dept. of the Interior, Bureau of Mines. Mineral Commodity Summaries 1993. U.S. Govt. Printing Office, 1992, p. 81.

(3) Statement of Dr. Hermann Enzer, Acting Director, U.S. Bureau of Mines, before the Subcommittee on Energy and Mineral Resources, House Committee on Natural Resources, May 20, 1993.

(4) Statement of James Duffus III, Director, Natural Resources Management Issues, General Accounting Office, before the Subcommittee on Energy and Mineral Resources, House Committee on Natural Resources, May 20, 1993.