

HELIUM

(Data in million cubic meters of contained helium gas,¹ unless otherwise noted)

Domestic Production and Use: During 1997, the estimated value of Grade-A (99.995% or better) helium extracted at the Bureau of Land Management's Exell Helium Plant was \$11.9 million; the estimated value of Grade-A helium extracted by private industry was about \$186.5 million. The total sales value for domestic consumption and exports was \$198.4 million. Ten private industry plants and one Government facility purified helium: four of the privately owned plants were in Kansas, two in Texas, two in Colorado, and one each in Utah, Oklahoma, and Wyoming. Crude helium was extracted from natural gas by an additional 10 private industry plants, and this helium was either stored in the Government's crude helium pipeline system or purified by 1 of the purification plants. Six of these crude helium plants were in Kansas, one in Oklahoma, and three in Texas. The estimated 1997 domestic consumption of 69.5 million cubic meters (2.5 billion cubic feet) was used for cryogenic applications, 24%; for welding cover gas, 18%; for pressurizing and purging, 20%; for controlled atmospheres, 16%; leak detection, 6%; breathing mixtures, 3%; and other, 13%.

Salient Statistics—United States:

	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997^e</u>
Helium extracted from natural gas ²	99.3	112.0	101.0	103	106
Withdrawn from storage ³	(3.8)	(11.6)	(5.2)	(8.3)	(10.1)
Grade-A helium sales	95.6	100.4	96.1	94.7	98.0
Imports for consumption	—	—	—	—	—
Exports ⁴	28.0	25.0	27.7	26.3	28.0
Consumption, apparent ⁴	67.5	75.4	68.1	67.1	69.5
Employment, plant, number ^e	600	615	635	631	631
Net import reliance ⁵ as a percent of apparent consumption	E	E	E	E	E

Price: The price of Grade-A gaseous helium was \$1.983 per cubic meter (\$55 per thousand cubic feet) f.o.b. Helium Operations facilities in 1996. The Federal Government's price for bulk liquid helium was \$2.524 per cubic meter measured as gas (\$70 per thousand cubic feet), with additional charges for container services and rent. Private industry's price for gaseous helium was about \$1.802 per cubic meter (\$50 per thousand cubic feet), with some producers posting surcharges to this price.

Recycling: In the United States, helium used in large-volume applications is seldom recycled. Some low-volume or liquid boiloff recovery systems are used. In Western Europe and Japan, helium recycling is practiced when economically feasible.

Import Sources (1993-96): None.

Tariff: Item	Number	Most favored nation (MFN)	Non-MFN⁶
		<u>12/31/97</u>	<u>12/31/97</u>
Helium	2804.29.0010	3.7% ad val.	25.0% ad val.

Depletion Allowance: Allowances are applicable to natural gas from which helium is extracted, but no allowance is granted directly to helium.

Government Stockpile: The Federal Helium Reserve is an operation run pursuant to Public Law 86-777. During 1997, Helium Operations accepted over 37 million cubic meters (1,334 million cubic feet) of private helium for storage and redelivered nearly 21 million cubic meters (757 million cubic feet) for a net increase in privately owned storage of more than 16 million cubic meters (577 million cubic feet). As of September 30, 1997, 125 million cubic meters (4.5 billion cubic feet) was owned by private firms, which is the largest amount to date.

Stockpile Status—9-30-97⁷ (Billion cubic meters)

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1997	Disposals FY 1997
Helium	839.8	—	839.2	—	—

Events, Trends, and Issues: Several events occurred during 1997. A crude helium plant in the northern Texas Panhandle resumed production in February 1997, and a crude plant in southeastern Kansas began production. The Bureau of Land Management's Helium Operations halted dewar sales of liquid helium in preparation for its mandated closure. The Helium Privatization Act of 1996 legislated an end to production and sale of refined helium by

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Helium Operations for Federal agencies' use by April 1998. Other parts of the Helium Program, such as operation of the helium storage system for both Government and private organizations and collection of helium royalties and fees, will continue.

It is estimated that in 1998 domestic production of helium will be over 101 million cubic meters (3.6 billion cubic feet) and that U.S. apparent consumption will be more than 72 million cubic meters (2.6 billion cubic feet). Exports from the United States are expected to decline because of planned production increases of an Algerian helium plant.

World Production, Reserves, and Reserve Base:

	Production		Reserves ⁹	Reserve base ⁹
	1996	1997 ^e		
United States	103	106	8,200	¹⁰ 12,200
Algeria	3.8	5.3	NA	2,100
Canada	NA	NA	NA	2,100
China	NA	NA	NA	1,100
Netherlands	NA	NA	NA	720
Poland	1.4	1.4	NA	830
Former Soviet Union ¹¹	4.2	4.2	4.2	9,200
Other countries	NA	NA	NA	2,100
World total (rounded)	111	112	NA	31,000

World Resources: The identified helium resources of the United States were estimated to be about 12.2 billion cubic meters (440 billion cubic feet) as of January 1, 1996. This includes 1.0 billion cubic meters (35 billion cubic feet) of helium stored in the Cliffside Field, 6.0 billion cubic meters (216 billion cubic feet) of helium in helium-rich natural gas (0.30% helium or more), and 5.2 billion cubic meters (188 billion cubic feet) in helium-lean natural gas (less than 0.30% helium). The Hugoton and Riley Ridge Fields are currently depleting gasfields and contain an estimated 4.2 billion cubic meters (151 billion cubic feet) of helium. Riley Ridge contains 3.2 billion cubic meters (116 billion cubic feet) of helium of which 1.9 billion cubic meters (68 billion cubic feet) is included in the depleting classification because this gas is now being produced. Future supplies will probably come from known helium-rich natural gas with little fuel value and from helium-lean resources. The identified helium-lean resources of 5.2 billion cubic meters (188 billion cubic feet) include 1.2 billion cubic meters (44 billion cubic feet) of measured and 4.0 billion cubic meters (144 billion cubic feet) of indicated helium resources. No resource studies have been performed since this report was last published; estimated production was subtracted from previous resource values where applicable.

Helium resources of the world exclusive of the United States were estimated to be 18.0 billion cubic meters (650 billion cubic feet). The locations and volumes of the principal deposits, in billion cubic meters, are the Former Soviet Union, 9.2; Algeria, 2.1; Canada, 2.1; China, 1.1; Poland, 0.8; and the Netherlands, 0.7. As of January 1, 1997, Helium Operations had analyzed nearly 21,000 gas samples from 26 countries and the United States in a program to identify world helium resources.

Substitutes: There is no substance that can be substituted for helium if temperatures below -429° F are required. Argon can be substituted for helium in welding, and hydrogen can be substituted for helium in some lighter-than-air applications in which the flammability of hydrogen is not objectionable. Hydrogen is also being investigated as a substitute for helium in deep-sea diving applications below 1,000 feet.

^eEstimated. E Net exporter. NA Not available.

¹Measured at 101.325 kilopascals absolute (14.696 psia) and 15° C. 27.737 cubic meters of helium at 15° C, 101.325 kPa (absolute) = 1 Mcf of helium at 70° F and 14.7 psia.

²Helium content of both Grade-A and crude helium (consisting of approximately 70% helium and 30% nitrogen).

³Extracted from natural gas in prior years (injected in parentheses).

⁴Grade-A helium.

⁵Defined as imports - exports + adjustments for Government and industry stock changes.

⁶See Appendix B.

⁷See Appendix C for definitions.

⁸The author is an industrial engineer with the Bureau of Land Management, Helium Operations, in Amarillo, TX.

⁹See Appendix D for definitions.

¹⁰All domestic measured and indicated helium resources in the United States.

¹¹As constituted before Dec. 1991.