

1978

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Recommended Citation

Edward Gerjuoy, *Helium Conservation: A Policy Matter Not to Be Taken Lightly*, 17 Duq. L. Rev. 115 (1978).
Available at: <https://dsc.duq.edu/dlr/vol17/iss1/13>

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Helium Conservation: A Policy Matter Not To Be Taken Lightly

*Edward Gerjuoy**

INTRODUCTION: HELIUM USES

It is probable that few members of the legal community are aware of the Helium Act Amendments of 1960¹ which authorize the Secretary of the Interior to purchase and store helium extracted from natural gas. Nevertheless, many of this nation's most prominent physical scientists believe the United States' long range energy prospects and concomitant economic well-being may hinge upon continued implementation of the Act's provisions for helium purchase and storage. These provisions, however, have been suspended since 1973. Arguing that a vital natural resource is being wasted, several of the country's most prestigious scientific societies have vigorously criticized the administration for failing to reinstate the helium purchase and storage program. The program has given rise to numerous lawsuits, with noteworthy environmental overtones. This article will amplify legal, social, and economic implications of the helium purchase and storage program.²

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1. Pub. L. No. 86-777 § 2, 74 Stat. 918, 50 U.S.C. § 167-167n. (1970).

2. The history of helium production and conservation in the United States, including the government's initial rationale for passage of the 1960 Helium Act Amendments and its later reasons for suspending helium purchases, has been described in numerous publications. See, e.g., Anderson, *Who Pays Is Key to Helium's Future*, CHEM. & ENG. NEWS 11 (1976) [hereinafter cited as Anderson]; Environmental Impact Statement, Bureau of Mines, U.S. Department of Interior, *Termination of Helium Purchase Contracts* (1972); S. REP. No. 1814 to Accompany Helium Act Amendments of 1960, reprinted in [1960] U.S. CODE CONG. & AD. NEWS 3595.

Comprehensive surveys of the helium controversy are contained in two recent reports: Interagency Helium Study, *Future Helium Requirements and Options for Supplying Projected Demand*, H.R. Doc. No. 7636, 95th Cong. (1978) [hereinafter cited as *Interagency Helium Study*]; National Academy of Sciences, *Helium: A Public Policy Problem* app. I (The National Resource Council ed. 1978) [hereinafter cited as *Helium Study Committee*].

In addition, there are a number of court opinions which present the history and current status of the helium controversy, including explanations of the existing and potential uses of helium. See, e.g., *Northern Natural Gas Co. v. Grounds*, 441 F.2d 704 (10th Cir.), cert.

Helium is the lightest chemically non-reactive gas; hydrogen, the only lighter gas, is reactive—often explosively. Therefore, helium is preferred in applications such as dirigibles and meteorological balloons which specifically require a low weight. Helium also is used in anesthesia, deep diving, and in a variety of circumstances where undesirable reactive gases must be excluded. However, the major reason for regarding helium conservation as an important national policy issue stems from another property of helium, namely, that helium remains a gas at lower temperatures than any other substance.³

The unique low temperature properties of helium are of great intrinsic scientific interest, and several Nobel Prizes have been awarded for liquid helium research.⁴ Continued interest in helium conservation is based not solely on the possibility of gaining new insights into the fundamental laws of physics, but also more immediately on established discoveries concerning the remarkable "superconducting"⁵ properties of many substances at low temperatures. Superconductors could make possible the use of electrical energy much more efficiently than present technologies permit.⁶ Superconductors also may be indispensable components of controlled thermonuclear fusion reactors, and important elements in

denied, 404 U.S. 951, 1063 (1971); *National Helium Corp. v. Morton*, 361 F. Supp. 78 (D.C. Kan. 1973).

3. For example, at atmospheric pressure helium liquefies at about -452 degrees Fahrenheit or -269 degrees Centigrade, which is only about 4 Centigrade degrees above absolute zero. The next lowest liquefaction temperature is hydrogen's at -253 degrees Centigrade, about 16 Centigrade degrees higher than helium's. Moreover, helium will remain liquid (will not freeze), at the lowest temperatures which have been reached.

4. The 1913 and 1962 Nobel Prizes in physics were awarded for liquid helium research. See *Nobel Lectures Physics 1901-1921* at 301 (1967) and *Nobel Lectures Physics 1942-1962* at 605 (1964). For a moderately non-technical discussion of the properties of liquid helium see E. Lifschitz, *Superfluidity*, 198 *SCIENTIFIC AMERICAN* 30 (June 1958).

5. Superconductivity is a topic of great scientific interest offering new insights into fundamental physical laws. A superconductor is capable of carrying electrical currents without dissipating any of the electrical energy in the wasteful heat losses always accompanying electric current conduction in ordinary conductors. For a non-technical discussion of superconductivity and related phenomena, see Matthias, *Superconductivity*, 197 *SCIENTIFIC AMERICAN* 92 (November 1957); Geballe, *New Superconductors*, 225 *SCIENTIFIC AMERICAN* 22 (November 1971).

6. See, e.g., *Superconducting Motors for U.S. Navy*, 7 *PHYSICS IN TECHNOLOGY* 274 (1976). Non-technical discussions of the use of superconductors in transmission lines are given by Snowden, *Superconductors for Power Transmission*, 226 *SCIENTIFIC AMERICAN* 84 (April 1972), and by Hammond, Metz, and Maugh, *Energy and the Future*, 101-108 (Amer. Ass'n. for Advancement of Science 1973).

the continued development of transportation systems and computers.⁷

For almost all materials, superconductivity can be attained only by cooling to temperatures well below the liquefaction temperature of hydrogen. Once a gas liquefies, a further reduction in its temperature is vastly more difficult. Thus, liquid helium is the indispensable coolant for achieving superconductivity in materials employed in superconducting devices. Superconductivity becomes the focal point of the helium controversy since, in most instances, substitutes can be found for the present and projected non-superconducting applications of helium. Proponents of continued helium conservation, although not unconcerned with assuring a supply of helium for non-superconducting applications, mainly fear that supplies will be inadequate when practical superconducting devices, absolutely dependent on helium cooling, become available for solving our energy, transportation, and computing needs.⁸ The opponents of a reinstated government helium purchase and storage program question the wisdom of authorizing expenditures at this time, effectively tying up millions of government dollars until the 21st century, without any definite assurance that the stored helium will be needed.⁹

HELIUM SUPPLIES AND DEMANDS

In order to properly compare the economic arguments against helium storage with the scientific arguments that helium must be preserved now for future superconducting applications, it is neces-

7. For a discussion of magnetic containment fusion see Rose, *Controlled Nuclear Fusion: Status and Outlook*, 172 *SCIENCE* 797 (May 21, 1971); Post, *Fusion Power*, 197 *SCIENTIFIC AMERICAN* 73 (December 1957); Gough and Eastlund, *The Prospects of Fusion Power*, 224 *SCIENTIFIC AMERICAN* 50 (February 1971).

The large magnetic field which can be generated using superconductors may be useable to levitate trains, thereby making possible very high speed, low friction transportation. For a discussion of superconductor magnetic field generation, see Sampson, Craig and Strongin, *Advances in Superconducting Magnets*, 216 *SCIENTIFIC AMERICAN* 114 (March 1967).

With normal (non-superconducting) computer elements there are inherent limitations on performance; it may be possible to overcome these limitations with superconducting elements. See Giordmaine, *Solid State Electronics: Scientific Basis for Future Advances*, 195 *SCIENCE* 1235 (March 18, 1977).

8. See, e.g., the 1978 National Academy of Sciences Report at 13-18.

9. See Lave, *Should the Government be Helium's Future*, *Helium Study Committee*, *supra* note 2, at 41-43 app. II [hereinafter cited as Lave].

sary to consider some of the basic quantitative facts.¹⁰ For example, worldwide consumption is roughly one BCF (billion cubic feet)¹¹ per year, and the United States consumes 70% of that. Furthermore, this nation produces all the helium it consumes, and in 1977 exported somewhat less than 0.2 BCF. It is doubtful that the rest of the world produced much more than 0.2 BCF of helium last year.¹²

The only practical means of extracting helium from a mixture of gases is by cooling to a sufficiently low temperature that all components except the helium liquefy, leaving a gaseous residue of almost pure helium. In this fashion, all needed quantities of helium could be extracted from the atmosphere, which contains a vast and essentially inexhaustible supply. Unfortunately, the relatively low concentration of helium in the atmosphere (about 5 parts per million) causes the extraction process to be expensive in terms of both energy expended¹³ and actual dollar costs.¹⁴ On the other hand, the concentration of helium in the so called helium-rich natural gas fields is much higher than the atmospheric levels. In fact, there are a few wells in the United States with helium concentrations of almost ten percent. This leads to the inescapable conclusion that atmospheric extraction of helium is, and always will be, energetically and eco-

10. Sources for the various facts concerning helium supplies and the 1960 Helium Act are listed in *Interagency Helium Study*, *supra* note 2, and in the *Helium Study Committee*, *supra* note 2 at *Executive Summary* 1-22; *Dimensions of the Helium Problem* at 23-32; and the contribution by Lipper, *Past and Present Uses of Helium* at 10-29 app. II.

11. By convention, a cubic foot of gas is understood to mean the mass of gas contained in one cubic foot at atmospheric pressure and at a temperature of zero degrees Centigrade.

12. This suggests two obvious questions: What are the sources of helium presently being consumed, and is there any special reason for the United States to be the major helium producing nation? The answers are simple. The only known sources of helium are the atmosphere and some natural gas fields, and the gas fields in which helium concentrations are high are located almost entirely in the Southwestern United States.

13. Various graphic phrasings of the costs of extracting helium from the atmosphere in the amounts needed to meet merely present (not future) needs can be found in the literature. For example, ERDA has concluded that the energy cost of producing one BCF per year of helium from the atmosphere would require at least 50% of the annual output of the Alaska pipeline. See Remarks of Leroy Culbertson, in *Helium Study Committee*, *supra* note 2, at 66 app. II.

14. Of course, if there were a market for the huge stocks of liquid oxygen and liquid nitrogen produced during the cooling process, the dollar costs of extracting helium from the atmosphere could be largely defrayed by the sale of those liquefied gasses. Unfortunately extraction of the quantities of helium needed to satisfy current and projected requirements would produce enormously greater volumes of liquid oxygen and nitrogen than the present and projected demands for these products could possibly absorb. See remarks of Francis, *Helium Study Committee*, *supra* note 2, at 136 app. II.

nomically expensive, whereas extraction of helium from helium-rich natural gas is far less costly.

Since the United States contains the world's largest supply of non-atmospheric helium,¹⁵ it is the only country in the position to possibly produce and market helium at moderate costs. It has been estimated that in the United States two-thirds of the helium is contained in helium-rich natural gas fields.¹⁶ A pragmatic approach to the appraisal of helium conservation policies requires reserves in known helium-rich fields to be supplemented by estimates of the helium content in natural gas fields not yet discovered. Although it may be difficult to make estimates for the entire world, the amount of helium remaining to be discovered can be accurately estimated for the United States. According to the Bureau of Mines, United States helium resources (including helium-lean and undiscovered fields) total about 700 BCF.¹⁷ If the 100 BCF of helium contained in known United States helium-rich fields were to remain extractable, and if the United States demand for helium were to continue at its present level, then this nation could easily meet its own helium demands for at least 100 years. By including the estimated helium supplies in helium-lean and undiscovered United States fields, the period during which this nation could meet its helium demands at costs significantly less than the cost of atmospheric extraction might be extended by approximately 1,000 years. However, it is generally agreed that non-superconducting conventional uses of helium will steadily increase during the next half century, and this will reduce significantly the period during which the United States can readily meet its own conventional helium demands. Accelerated exhaustion of our natural gas helium supplies will ensue

15. This claim is not difficult to substantiate. If the term helium-rich is defined to denote natural gas containing 0.3 percent or more helium, then the only known helium-rich natural gas reserves outside the United States lie in Canada. The total helium in the Canadian helium-rich fields is estimated to be 4.3 BCF, whereas the total helium remaining in the known United States helium-rich fields is thought to be about 100 BCF. Moreover, extraction from helium-lean fields would not vastly increase the total amount of helium potentially extractable from natural gas without high extraction costs.

16. Nevertheless, the amount of helium in helium-lean natural gas wells outside of the United States is far from negligible. For example, the Algerian natural gas field could yield 100 BCF of helium at an extraction cost two to three times greater than United States extraction costs. See the remarks of Howland, *Helium Study Committee, supra* note 2, at 44, 45 app. II, and of Henrie *supra* note 2, at 130 app. II.

17. Henrie, *Management of Helium Resources, Helium Study Committee, supra* note 2, at 129 app. II.

if the hoped-for large scale applications of superconductivity become practical in the 21st century. It is also important to realize that the mere presence of helium in natural gas fields, whether helium-rich or helium-poor, is of no consequence unless the helium is extracted before the natural gas receives its primary use—combustion to produce heat. During combustion the unextracted helium gas component of the otherwise combustible natural gas escapes into the atmosphere. Therefore, unless the helium presently contained in our natural gas fields is extracted and stored for future needs before those fields are substantially depleted, it is likely that the United States' helium demands in the major portion of the 21st century will be dependent upon high-cost atmospheric extraction. It is stressed, however, that this last conclusion does not in and of itself justify current implementation of a government natural gas helium extraction and storage program. The arguments favoring such a program (mainly the high likelihood of otherwise having to rely on expensive atmosphere-extracted helium in the 21st century) must be balanced against the economic arguments opposing the program.

THE HELIUM ACT STORAGE PROGRAM—LEGAL ISSUES

The foregoing discussion has laid the groundwork for an analysis of the Helium Act Amendments of 1960 and the authorized helium storage program, the abrupt termination of which by the Secretary of the Interior spawned the present helium conservation controversy.

Prior to 1960, the Bureau of Mines was essentially the sole producer and purveyor of helium in the United States pursuant to congressionally granted authority under the Helium Acts of 1925 and 1937.¹⁸ Persuaded that the nation faced a shortage of relatively inexpensive helium, Congress in 1960 authorized the Secretary of the Interior to make contracts for the acquisition, processing, transportation or conservation of helium for periods not exceeding twenty-five years.¹⁹ The Secretary was authorized to sell helium at prices established by him which would adequately cover all costs, including interest, within 25 years.²⁰ Elsewhere, the 1960 Amendments

18. *Helium Study Committee, supra note 2, at 19.*

19. 50 U.S.C. § 167a (a)(2) (1970).

20. 50 U.S.C. § 167d (c) (1970).

declared that it was in the national interest to foster and encourage individual enterprise in the development and distribution of supplies of helium while at the same time providing a sustained supply of helium which would be sufficient to support essential government activities.²¹

Pursuant to the Helium Act Amendments, the Secretary of the Interior entered into contracts to purchase helium extracted by four different companies from the pipeline natural gas they controlled.²² Each contract was for twenty-two years, with the total dollar amounts of helium to be purchased per year from the four suppliers limited to \$47.5 million. Presumably in reliance on these contracts, the four companies built helium extraction plants; between 1962 and 1973 the Secretary purchased a total of 32 BCF of helium, costing \$385 million.²³ Until used by the government, or sold to other consumers under the Act's authority, helium was stored in the Bureau of Mines storage system. To comply with the congressional mandate that the purchase and storage program repay its costs within twenty-five years,²⁴ the Secretary in 1961 raised his selling price of helium to \$35 per MCF (thousand cubic feet) from a previous price of between \$15 and \$19 per MCF.²⁵ The new price was well above the \$20-25 figure which private helium producers were charging their customers.²⁶

The Helium Act Amendments required government agencies to purchase helium from the Secretary of the Interior,²⁷ although his selling price was above the market price. However, the government's needs for helium did not grow as rapidly as had been anticipated in 1960,²⁸ and private consumers could purchase helium from

21. 50 U.S.C. § 167m (1970).

22. The contractors were Northern National Gas Co., (Northern Helix), limited to a maximum of \$9.5 million per year, at a price (in 1961) of \$11.24 per thousand cubic feet (MCF) of helium; Cities Service Helix, maximum sales \$9.1 million per year, at \$11.75 per MCF; National Helium, maximum sales \$15.2 million per year, at \$11.78 per MCF; Phillips Petroleum, maximum sales \$13.7 million per year at \$10.30 per MCF. *Northern Natural Gas Co. v. Grounds*, 441 F.2d at 716-17.

23. 1 *Interagency Helium Study*, *supra* note 2, at 4; and 2 *Interagency Helium Study*, *supra* note 2, at 5.

24. *See* note 19 *supra*.

25. 2 *Interagency Helium Study*, *supra* note 2, at 5; *Helium Study Committee*, *supra* note 2, at 127 app. II.

26. *Id.* at 29; *Ashland Oil v. Phillips Petroleum*, 364 F. Supp. 6, 9 (N.D. Okla. 1973).

27. 50 U.S.C. § 167d (a) (1970).

28. 2 *Interagency Helium Study*, *supra* note 2, at 26.

private producers at a much lower price.²⁹ Consequently, the purchase and storage program was \$211 million in debt by 1970³⁰ with little prospect of being able to liquidate this debt by 1985 as required by the Act. Moreover, the amount of stored helium at the end of 1970 was 100 times the Bureau of Mines' total helium sales to government and private consumers during fiscal year 1970.³¹ Therefore, the Secretary of the Interior, asserting that continuation of the helium purchases by the government was no longer necessary to provide a sustained supply of helium sufficient to provide for essential government activities, unilaterally terminated the aforementioned four contracts in January, 1971.³² Three of the four suppliers sued to enjoin termination of the purchases.³³ After considerable litigation the power of the Secretary to terminate the contracts was

29. In an attempt to keep the Government's helium sales from dropping, the Secretary of the Interior published regulations (33 Fed. Reg. 15478 (1968)) forbidding *contractors* of government agencies from purchasing helium from any source but the Secretary. However, these regulations were struck down as exceeding his Congressionally authorized powers. *Air Reduction Co. v. Hickel*, 420 F.2d 592 (D.C. Cir. 1969).

30. 2 *Interagency Helium Study*, *supra* note 2, at 40.

31. *Id.* at 28.

32. The Secretary acted under a termination clause in the contracts which stated: "Buyer may . . . terminate this contract at any time if . . . in the opinion of the Secretary of the Interior . . . a substantial diminution in helium requirements . . . would make the . . . continued purchase of helium-gas . . . unnecessary to accomplish the purposes of the Act." *National Helium Corp. v. Morton*, 455 F.2d 650, 653 (10th Cir. 1971).

33. The plaintiffs claimed that the Secretary of the Interior could not terminate the contract without filing an environmental impact statement as required by the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 (1970), because the helium—if not extracted from natural gas—would be vented into the atmosphere with environmental consequences. The court upheld this view, and issued an injunction preventing the Secretary from terminating the contract until he had complied with the NEPA requirements. *National Helium Corp. v. Morton*, 455 F.2d 650 (10th Cir. 1971). After some time the Secretary did file an environmental impact statement, and restated his intent to terminate the contracts (as of April 4, 1973). Nevertheless, the district court refused to dissolve the previous injunction, on the grounds that the environmental impact statement was inadequate, and that therefore the Secretary could not have taken the "hard look" at the possible environmental impacts of his action which NEPA requires. The district court also ruled that the Secretary's failure to hold public hearings before terminating the contracts constituted an abuse of discretion. *National Helium Corp. v. Morton*, 361 F. Supp. 78 (D.C. Kans. 1973). However, the court of appeals reversed and ordered an end to the injunction, stating that under a rule of reason standard the Secretary had fulfilled the only requirement NEPA imposed upon him, namely to file and to consider an impact statement furnishing a reasonable discussion of relevant subject matter, in objective good faith compliance with the demands of NEPA. *National Helium Corp. v. Morton*, 486 F.2d 995 (10th Cir. 1973), *cert. denied*, 416 U.S. 993. The environmental impact statement which is the subject of these decisions is contained in note 2 *supra*.

upheld,³⁴ but the ruling that the Secretary did not abuse his discretion in terminating the contracts did not necessarily relieve the government of liability for material breach of contract.³⁵ The Court of Claims thus far has refused to decide if the termination of the contracts was a material breach.³⁶

The legislative history of the 1960 Helium Act Amendments clearly indicates that the major purpose of the Act was to ensure a supply of helium for the essential government activities of agencies such as the Defense Department, the Atomic Energy Commission, and the National Aeronautics and Space Administration.³⁷ The government had not intended to conserve helium for the new technologies of the 21st century, and lost interest in the helium purchase program when the Federal agencies' helium demands began to fall far short of the amounts originally envisaged.³⁸ From this viewpoint, the Secretary of the Interior's termination of the program was consistent with congressional intent.

On the other hand, if it could be determined that helium conservation for 21st century needs is in the long-term national interest, then the Interior Department should be doing its best to foster hel-

34. National Helium Corp. v. Morton, 486 F.2d 995 (10th Cir. 1973).

35. During the years preceding 1969, Congress failed to appropriate enough money to make up for the continuing deficits caused by the government's failure to sell as much helium as originally anticipated, although it was obligated to purchase helium at the rates originally contracted for in 1961. Consequently the government failed to make full payments during 1969, and paid nothing during 1970. The court of claims has agreed that this failure to make payments, before giving any notice that the contract was being terminated, constituted a material breach of contract by the Secretary. Northern Helix Co. v. United States, 455 F.2d 546 (Ct. Cl. 1972).

36. The litigation on whether the contract termination was a material breach has been tangled by the government's previous failure to make payments, see note 34 *supra*, and by the companies' insistence on continuing to furnish helium although the Secretary no longer wanted the helium and was trying to terminate the contract. This insistence could be regarded as having lost the companies their rights under the government's earlier material breach of failure to make payments. Cities Service Helix v. United States, 543 F.2d 1306 (Ct. Cl. 1976); Northern Helix Co. v. United States, 524 F.2d 707 (Ct. Cl. 1975), *cert. denied*, 429 U.S. 866; Northern Helix Co. v. United States, 455 F.2d 546 (Ct. Cl. 1972).

37. 1960 U.S. CODE CONG. & AD. NEWS 3595. The belief that Congress was largely motivated by fear of a shortage of helium for defense needs (including space activities) is reinforced by the fact that the Helium Act Amendments of 1960, like earlier Helium Acts, made explicit references to defense needs and were codified under Title 50, "War and National Defense." See, e.g., 50 U.S.C. §§ 167b and 167c (1970). The 1960 Act revised and repealed the former 50 U.S.C. §§ 161-166.

38. The mere fact that the Secretary of the Interior was supposed to cover the costs of the program via helium sales shows that helium conservation for the distant future was not a primary Congressional intent. See note 19 *supra*.

ium conservation by private industry. This would be proper even if the executive branch concluded that continued helium purchases by the government were inconsistent with the original narrow congressional mandate. An approach of this sort to the helium conservation problem would be in accord with Lave's views concerning the government's proper role³⁹ and, if it succeeded in preventing wasteful loss of helium to the atmosphere as our natural gas is combusted, would satisfy the critics of present policy. As a matter of fact, the Interior Department has adopted just such an approach. Since 1975, the government has instituted a program whereby it will store helium for private firms at low storage and redelivery charges. As added incentives, the helium can be redelivered in a purified form and storage charges are deferred until redelivery.⁴⁰ Nevertheless, most of the helium being taken out of the earth in natural gas every year continues to be released to the atmosphere without extraction and, therefore, is wasted.⁴¹

The continued waste of helium compels one to conclude that the government's present approach to encouraging helium conservation by private industry cannot realistically be termed successful. One of the former helium suppliers finds the government's storage program so unattractive, despite the reduced storage rates and other inducements,⁴² that it deliberately has rejected storing the helium it is extracting from natural gas in favor of venting this extracted helium into the atmosphere.⁴³ This is by no means an imprudent business judgment in light of the present circumstances, which include a line of cases where resolution might heavily penalize private companies *and* the government for undertaking helium storage.

An examination of precedents which lead to this conclusion might be enlightening. Before 1960, neither the landowners who leased the oil and gas rights to the producers, nor the producers who sold the gas to the pipeline companies, cared that natural gas contains helium. After the Interior Department signed its contracts with pipe-

39. See Lave, *supra* note 9.

40. 1 *Interagency Helium Study*, *supra* note 2, at 11. The rates for accepting, storing and redelivering the gas, per thousand cubic feet, were respectively 4 cents, 4 cents, and 22 cents; the corresponding former rates were 44 cents, 44 cents, and 44 cents respectively. See Anderson, *supra* note 2.

41. 1 *Interagency Helium Study*, *supra* note 2, at 11.

42. *Id.*

43. See 1 *Interagency Helium Report*, *supra* note 2, at 60; and *Helium Study Committee*, *supra* note 2, at 28. See also note 58 *infra*.

line companies to purchase helium, however, the landowners sued the producers and the producers sued the pipeline companies to recover lost income. The property owners complained that although they had given the producers oil and gas leases, the term "gas" was intended to include combustible gas only, and not inert helium. Thus, the property owners contended, the producers had never received title to the helium and could not legally convey the helium to the pipeline companies.⁴⁴ The producers argued that they indeed had received title to the helium, but nevertheless echoed the landowners by complaining that the gas sales contracts the producers had with the pipeline companies were intended to include combustible gas only. On an unjust enrichment theory, the producers claimed they were entitled to compensation for the reasonable value of the helium the pipeline companies had been extracting and selling to the detriment of the producers.⁴⁵ The pipeline companies disclaimed any liability to the producers arguing instead that the producers had contracted to deliver the gas stream in its entirety.⁴⁶

The court in *Northern Natural Gas Co. v. Grounds* held that the leases had been intended to include helium, meaning the producers had received title to the helium from the landowners.⁴⁷ Furthermore, the price for delivered gas quoted in the producers' sales contract with the pipeline companies could not have been intended to include the value of the helium because under the Natural Gas Act,⁴⁸ the price was regulated by the Federal Power Commission, which is concerned only with the value of the natural gas as a fuel.⁴⁹ Fi-

44. *Northern Natural Gas Co. v. Grounds*, 441 F.2d at 710-15.

45. *Id.* at 715-20.

46. *Id.* at 720-22.

47. The court's language was, "We conclude that, absent specific reservations, the grant of gas by the lease covered all components of the gas, including helium." *Id.* at 715.

48. 15 U.S.C. §§ 717-717w (1970).

49. The court's reasoning in reaching this holding merits quotation:

The Helex companies insist that the equities favor them. They say that they built the multi-million dollar extraction plants and assumed the necessary risks. They charge that the lessee-producers stood idly by while the risks were taken, the money invested, and the work done by others. In support of the principle that equity does not take from those who earn it and reward those who silently stand aside and await the success of the enterprise, they cite the refreshing authority found in the folk-tale of the Little Red Hen.

At this point the court adds a footnote explaining the Little Red Hen's thesis, "You remember that I planted the wheat, and cut it, I carried it to mill, I made the bread and baked it—and now all of you would help me eat it! No, indeed." The court then goes on to distinguish and reject the Little Red Hen's precedent:

nally, the court ordered the pipeline companies to recompense the producers for the value of the helium delivered. The producers in turn were to pay the landowners royalties on proceeds received from the helium gas sales to the pipeline companies.⁵⁰ The court refrained from determining the value of the helium delivered and the case was remanded to the district court for determination of this value.⁵¹

The Supreme Court declined to review the case⁵² and it stands as law in the 10th Circuit. Thereafter, different courts have arrived at widely differing valuations of the helium delivered to the pipeline operators. A Kansas district court, after examining "comparable sales", ruled that the market value of the commingled, unextracted helium at the point of delivery to the pipeline companies was 60 to 70 cents per MCF.⁵³ Apparently this court felt that before extraction by the pipeline companies the helium was worth very little in comparison to its purified market value of \$20-\$25 per MCF. On the other hand, an Oklahoma district court valued the helium in the range of \$12 to \$17 per MCF, after subtracting the extraction costs from the established market price of purified helium,⁵⁴ evidently feeling that the extraction process had added much less value to the commingled helium than the Kansas court thought. The Oklahoma court's "work-back" method of valuing the unextracted helium was affirmed by the 10th Circuit, which said the comparable sales method used by the Kansas district court was inapplicable.⁵⁵

The activities of the Little Red Hen were not those of a public utility, and neither the product nor the ingredients thereof were subject to governmental rate regulation. Therein lies the difference. In our opinion private contract law and the principles applicable thereto are not controlling. This makes it unnecessary for us to delve into the many cases and texts bearing on the respective rights of parties to private contracts.

441 F.2d at 718-23.

50. *Id.* at 723.

51. *Id.*

52. In another opinion, the Supreme Court appeared to agree with the *Grounds* holding that natural gas prices regulated under the Natural Gas Act should not be regarded as including payment for the helium in the gas. *Phillips Petroleum Co. v. Texaco*, 415 U.S. 125 (1974).

53. *Northern Natural Gas Co. v. Grounds*, 393 F. Supp. 949, 984 (D.C. Kan 1974).

54. *Ashland Oil, Inc. v. Phillips Petroleum*, 364 F. Supp. 6 (N.D. Okla. 1973).

55. *Ashland Oil, Inc. v. Phillips Petroleum*, 554 F.2d 381 (10th Cir. 1975), *cert. denied*, 434 U.S. 921 (1977). The court wrote, "It is obvious that the comparable sales—currently market price is by far the preferable method when it can be used. However, it cannot be used when the elements necessary for its proper application are lacking. The trial court thus had to resort to a work-back method or price less costs of beneficiation. This was a less desirable method but perfectly valid." *Id.* at 387. Despite this language, the court did not

To date, no other decisions on the helium valuation issue have been reported, although a number of cases dealing with the issue are pending.⁵⁶ The 10th Circuit did remand *Ashland Oil vs. Phillips Petroleum*⁵⁷ to the Oklahoma district court to re-examine, *inter alia*, the starting value from which extraction costs are to be subtracted. The Oklahoma court has not yet reached a decision, but it is unlikely that its recomputed work-back value of the commingled helium will be much less than the \$12 to \$17 per MCF range found previously.

This protracted litigation, especially the *Ashland* results, explains the pipeline companies' cool reception toward the government's present helium storage program despite the incentives offered to private industry. The pipeline companies have already incurred a \$96 million liability, even considering their apparently limited liability of \$3 per MCF,⁵⁸ for participating in the government's 1962-1973 storage program. The penalty is further compounded by the anticipated length of time helium may have to be stored before it is again in high demand. Thus, it is quite understandable that pipeline companies are hesitant to undertake further helium storage. Since the storage now would no longer be under the government purchase contracts and their indemnification clause, a potential full liability to the producers \$12 to \$17 per MCF is possible. Although not all the pipeline companies have drawn the same conclusion, at least one company apparently feels it must vent the extracted helium to avoid the potential liability for unjustifiably enriching itself

explicitly overrule the Kansas District Court's valuation of the helium in *Grounds*, although Kansas, like Oklahoma, is in the Tenth Circuit.

56. *Amoco Production Co. v. Phillips Petroleum* (No. 44, 864, 108th Judicial District Court, Texas); *Cities Service Oil Co. v. Phillips Petroleum* (No. C-75-818, D.C. Tulsa County, Okla.); *Texas, Inc. v. Phillips Petroleum* (No. C-75-90, D.C. Tulsa County, Okla.). *Grounds* is still on appeal to the Tenth Circuit. See note 52 *supra*. See also 2 *Interagency Helium Study*, *supra* note 2, at 45-49, and the Secretary of the Interior, *Report to the Congress on Matters Contained in the Helium Act*, Fiscal Year 1976 6-10 (Oct. 1976) [hereinafter cited as *Report*].

57. See note 54 *supra*.

58. The *Report*, *supra* note 56, at 6, states "The Government is interested in the outcome of the litigation because the four helium purchase contracts it has entered into contain provisions under which the United States may be required to indemnify the helium extraction companies if the latter are required to pay the lessee-producers more than about \$3 per thousand cubic feet of helium." The exact text of the indemnification clause is given in *Ashland Oil v. Phillips*, 364 F. Supp. 6, 8 (N.D. Okla. 1973). The \$96 million liability figure equals the value, at \$3 per MCF of the 32 BCF of helium sold to the government during the period 1962-1973. See note 22 *supra*.

with the helium received from the producers.⁵⁹ Statements by pipeline company representatives detailing the disincentives they discern in the present helium storage program can be found in the literature.⁶⁰

RECENT HELIUM CONSERVATION POLICY PROPOSALS

As stressed earlier, it may be argued that the socio-economic costs of tying up millions of dollars in helium storage are unwarranted when balanced against the lack of definite assurance that the stored helium will be needed in the 21st century. The proposition, although not indefensible, appears to have few adherents. For example, Lave argues mainly against a government helium storage program⁶¹ and is not unwilling to have private industry invest in helium storage, should it so desire.⁶² Cities Services, while venting its already extracted helium, agrees the originally authorized helium storage program "has been a wonderful thing" and feels it is regrettable that the program was stopped.⁶³ Although unwilling to continue storing government owned helium, the government's announced and implemented policy since 1975 has been to encourage helium storage by private industry in government facilities. However, a recent defense of the government's present policy by Dr. Frank Press, Director of the White House Office of Scientific and Technology Policy, does employ language suggesting disagreement with the proposition that helium storage at this time is warranted. The only specific conclusion Dr. Press is willing to draw is, "While insufficient analysis has yet been done on this issue, the weight of evidence currently avail-

59. Of the four original contractors with the government, Northern Helix took advantage of the Government's new private industry helium storage incentive program shortly after it was announced in 1975. Phillips Petroleum shut down one of its two extraction plants, but since December 1977 has been storing helium from its other extraction plant, at a rate of about 0.4 BCF per year. Cities Service continues to vent about 0.6 BCF of extracted helium per year. National Helium has shut down. *Helium Study Committee, supra note 2, at 28; 2 Interagency Helium Report, supra note 2, at 21.*

60. See Comments of Leroy Culbertson, *Helium Study Committee, supra note 2, at 65 app. II*; and George C. Vaughan, *id.* at 68.

61. See note 38 and accompanying text *supra*.

62. In fact, Lave has stated explicitly: "I would personally be happy to put my own funds in helium storage. Helium is a good investment. Given all of the wild uncertainties with respect to future government regulation and so on, it still would earn a handsome rate of return." *Helium Study Committee, supra note 2, at 72 app. II.*

63. Remarks of George C. Vaughan, *supra note 60.*

able would not suggest to me the need to initiate a government stockpile program now."⁶⁴

Because Dr. Press is a very distinguished scientist as well as an important government spokesman, his views must be given great weight. Nonetheless, his arguments and his conclusions are rejected by the overwhelming majority of this nation's physical scientists, who are convinced that current increased helium storage now by some agency is warranted, and in fact essential, despite the uncertainties inherent in predicting helium requirements and costs into the future. As the physical scientists perceive it, if private industry refuses or is unable to prevent the release into the atmosphere of the natural gas helium, then the government must do the preventing. Recent statements on helium conservation by several of our most distinguished scientific organizations are uncompromising in their affirmations that as much helium as possible must be stored now to ensure its availability in the future. In particular, the American Physical Society believes that the reasons for the original conservation program remain valid and supports the continuation of such a program.⁶⁵ The American Chemical Society has specifically urged Congress to pass emergency legislation.⁶⁶ In addition, the National Academy of Sciences, this nation's most prestigious scientific organization, has urged the government to recommence the storage of government owned helium and to prevent the venting of already extracted helium.⁶⁷

The advocates of a program to increase helium storage have offered a variety of proposals to accomplish this goal. Such proposals generally call on the government to accept the major responsibility for helium storage. Proposals for renewed storage of government owned helium tend to be coupled with specific provisions to encourage industry to store helium. Proposals of this type include:

1. Improved tax treatment for stored helium,⁶⁸

64. Letter from Dr. Frank Press to Dr. Phillip Handler (September 26, 1977).

65. *American Physical Society Panel on Public Affairs Statement on Helium Conservation*, 31 *PHYSICS TODAY* 24 (April 1978).

66. 56 *CHEMICAL AND ENGINEERING NEWS* 4 (February 6, 1978).

67. *Helium Study Committee*, *supra* note 2, at 3.

68. *Id.* at 2. Such improved tax treatment might include, e.g., exempting stored helium from state and local *ad valorem* taxes or (if such exemption is not constitutional) federal tax credits against such state and local taxes.

2. Permitting Federal agencies to obtain their helium from private industry,⁶⁹
3. Increasing to at least 50 years the government commitment to store privately owned helium in government storage facilities,⁷⁰
4. Institution of a "helium degradation penalty" which would tax or fine pipeline companies who distribute helium-rich natural gas to consumers for combustion without arranging for helium extraction, and which would similarly penalize helium extractors who vent already extracted helium rather than storing it or selling it for non-wasteful use.⁷¹

Legislation reinstating the government's helium purchase and storage program, and incorporating some of private industry storage incentives, has been introduced in the Senate.⁷² More importantly, this proposed legislation embodies a congressional intent to conserve helium for future technology, thereby remedying the deficiencies of the 1960 Helium Act Amendments which permitted the Secretary of the Interior to unilaterally cancel the government's helium purchase contracts.⁷³

Evidently the author of this legislation, who is not a physical scientist and therefore cannot automatically be accused of downplaying economic realities in favor of technological hopes, also rejects Lave's thesis that helium storage should be solely the responsibility and province of private industry. Indeed, on balance this rejection does seem reasonable. If current helium storage is a good investment for industry because comparatively inexpensive helium will be essential for 21st century technology, then it appears to be excessively doctrinaire to insist the government should not be storing this 21st century requisite.

OVERVIEW AND CONCLUSIONS

Regrettably, one must conclude that his survey amounts to an indictment of our nation's political, economic and legal priorities.

69. *Id.* at 140 app. II.

70. Letter from Professor M. Tinkham to Dr. Phillip Handler (February 27, 1978).

71. *Id.* See also *Helium Study Committee*, *supra* note 2, at 2.

72. Kansas Senator Pearson on September 19, 1977, introduced S. 2109, titled the "National Helium Conservation Policy Act." The bill was referred to the Committee on Energy and Natural Resources.

73. See note 33 *supra*.

Helium is a unique substance, possessing remarkable properties. It happens to be highly concentrated—and thus comparatively cheaply extractable—only in some United States natural gas fields. Even if no useful applications of helium were presently foreseeable, one would expect a modern civilized nation to prudently conserve such a resource, not merely out of deference to nature's bounty, but also because our scientific and technological experience has amply demonstrated the likelihood of finding future uses for presently unusable materials. Moreover, useful applications are presently foreseeable, though perhaps not wholly certain. Yet this potential utility, making helium more valuable today than it otherwise would be, appears to have diminished rather than increased the prospects for storing helium against the inevitable day when our natural gas fields will become depleted. Because Congress thought helium would be valuable, it saddled the 1960 helium purchase and storage program with the requirement that the program pay for itself within twenty-five years. The legal morass created by the 1960 program has made both the government and the helium extractors uncertain of their past liability for helium received and fearful that storing helium in the future will only increase chances for further potential liability.⁷⁴ The fact that helium is subject to *ad valorem* taxes when stored further reduces private industry's incentive to store it, especially in view of the fact that these taxes might have to be paid well into the 21st century.

Proposed bill S. 2109 eliminates the requirement that the government's helium storage program pay interest,⁷⁵ and possesses other features which remedy the deficiencies of the 1960 Act⁷⁶ and decrease the likelihood of wastage. Yet the bill calls for considerably smaller helium purchase expenditures than authorized under the 1960 Act.⁷⁷ Even at the originally contracted helium purchase prices, the \$20 million per year expenditure called for would store less than 2 BCF per year, an amount much smaller than the 7 BCF

74. See text and discussion accompanying notes 57-59 *supra*.

75. See text accompanying note 19 *supra*.

76. In particular, S. 2109 permits Federal agencies to purchase helium from private suppliers, and simultaneously eliminates the 1960 Helium Act requirement that the helium conservation program costs be self-liquidating. See notes 19 & 23 and accompanying text *supra*.

77. The bill limits helium purchase expenditures to an average of \$20 million per year for the next 12 years; \$20 million is less than half the annual expenditures the 1960 Act authorized for 22 years. See text accompanying note 21 *supra*.

per year which leaves the ground in helium-rich natural gas.⁷⁸ Yet even this proposal appears to have little chance of passage in the near future. The bill has been tied up in the Senate Committee on Energy and Natural Resources, and no congressman has even introduced a corresponding helium storage bill in the House of Representatives. Moreover, the executive branch continues to adhere to Dr. Press' conclusion that at this time there is no need to initiate a government storage program.⁷⁹

The difficulties inherent in effectuating sound environmental conservation policies are systemic; congressmen who vote now for environmental policies benefiting future generations have to find the funds from taxes imposed on their present constituents, not from future beneficiaries of such environmental laws. Corporate executives who invest funds now for even assured huge profits too far in the future may find themselves facing angry shareholders who want more dividends today. Judges are required by our laws to make property settlements now without regard to the likely harmful effects on the technologies of future generations. The helium conservation controversy is but one example, albeit a remarkably legally tangled one, of those policy issues whose resolution today, by today's politicians and judges, will more vitally affect future generations than today's contending parties.⁸⁰

78. One would expect the suppliers to demand considerably higher prices today, in view of the inflation since 1961.

79. 1 *Interagency Helium Study*, *supra* note 2, at 1. The actual language used in this study, prepared by representatives of the Defense, Interior and Energy Departments, together with a representative of NASA, was, "At least in the short term, it is unsound for the Federal Government to buy helium for storage."

80. One suggestion for dealing with policy issues involving highly technical matters, the so-called Science Court proposal, was the subject of an educational program, *Curbing Ignorance and Arrogance: The Science Court Proposal and Alternatives*, presented at the American Bar Association, August 1978, New York centennial meeting by its section of Science and Technology. The section expects to publish the talks given in this program.