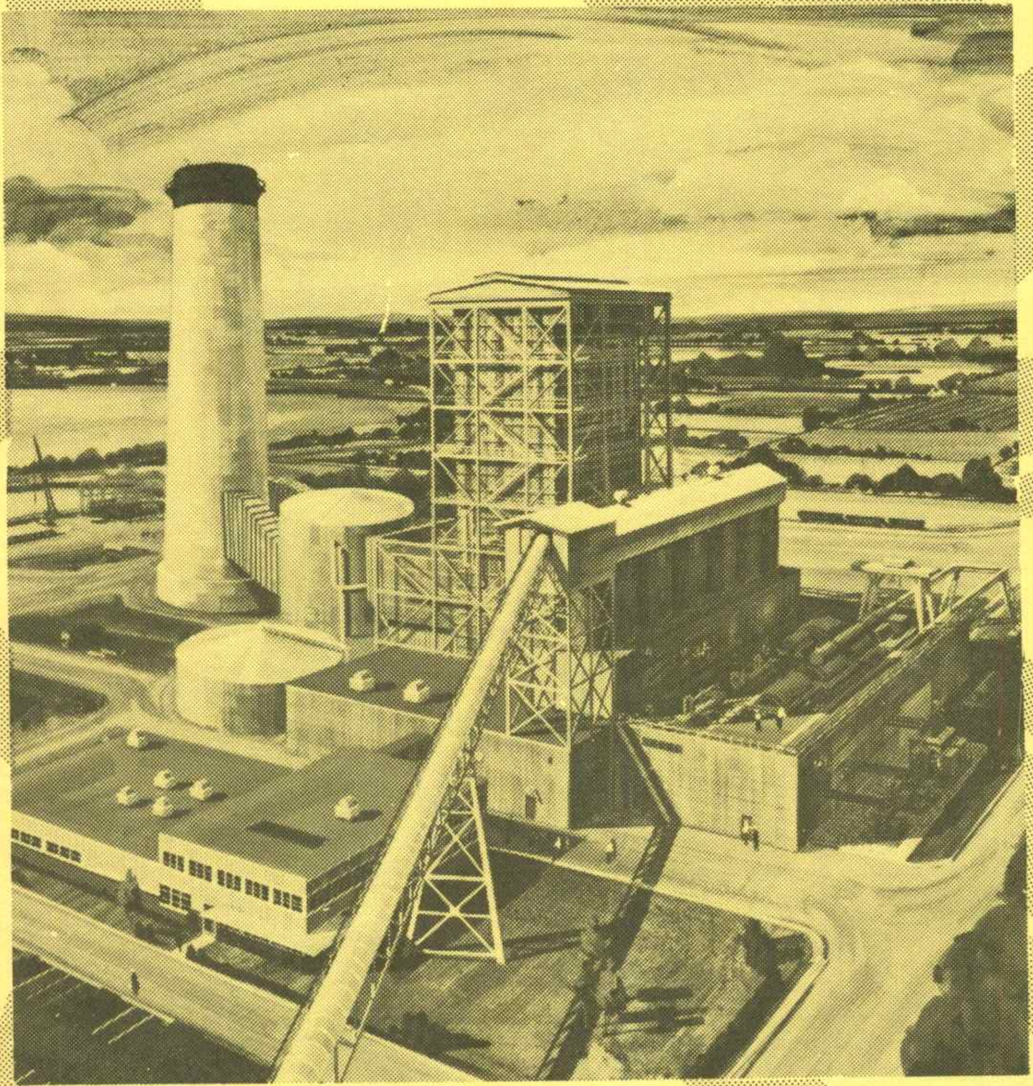
1968
Kansas Mineral Industry



Special Distribution Publication 40

State Geological Survey

The University of Kansas, Lawrence

By Allison L. Hornbaker and Ronald G. Hardy

Estimated values presented in this publication and on the accompanying charts are based mainly on statistical data obtained from Kansas mineral producers, the Kansas State Corporation Commission, the United States Bureau of Mines, and other sources.

ACKNOWLEDGMENTS

Our appreciation is extended to the Kansas City Power and Light Company and Kansas Gas and Electric Company for the architects' conception of the La Cygne Power Plant shown on the front cover. The authors also wish to express their appreciation to Robert Dilts, Sara Marnane, Helen Wolfe, Nancy Porter, Jo Anne Crossfield, Jo Ann Dalquest, Sharon Hagen and Charles Barksdale.

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The State Geological Survey and the Kansas Mineral Industry

Frank C. Foley, Director

Preparation of the annual report on the statistics of the Kansas mineral industry is just one of the functions of the State Geological Survey of Kansas in its role as promoter of the development of the mineral industry in Kansas. For many years the Survey has prepared an annual report on the mineral production of the previous calendar year.

The activities of the Survey in the development of the Kansas mineral industry are many and varied. One of the principal activities is the detailed study of the ground-water resources of the State. The uses to which water is put are many and varied, and it is impossible to place a dollar value on water--in spite of the fact that it is a mineral resource, and that its inclusion in this report would increase the total value of 1968 Kansas production markedly.

Many of the activities of the Geological Survey are continuing studies and projects. The Survey has conducted studies of the clay resources of the State for many years and has had a hand in the development of the ceramic industry in Kansas. These studies are continuing, with a detailed evaluation of bentonite, not only in the field but also in the laboratory to determine uses to which bentonitic clays may be put.

During the past year the Survey's work in developing potential uses for the considerable deposits of volcanic ash in the State have come to fruition with the construction and operation by Interpace Corporation of a plant at Mankato, Kansas, to process volcanic ash for industrial use under the trade name CORCEL. The many potential uses for the volcanic ash, both raw and treated, promise to add considerably to the mineral wealth of the State.

Basic research on geological principles continues, especially in the Survey's Geologic Research Section. Information obtained on the processes of formation of the rocks in Kansas may lead to indications as to where petroleum has accumulated.

Other studies, in the Geochemistry Section and by the Senior Geologist, are investigations of occurrence of metals, especially lead and zinc, in the sedimentary rocks of the State. With information now being gathered we hope to be able to locate commercial deposits of metals. However, the work is not yet far enough along to allow for any predictions.

Research on the mineral content of oil-field brines in Kansas continues and it is our hope that some day we will develop markets for the minerals dissolved in the brines. These brines could become a valuable resource rather than a useless material to be disposed of at a high cost.

The additional accumulation of technical and industrial data requires that the Survey continue its ongoing program of electronic data manipulation and retrieval. The use of the computer in some areas has been pioneered by the Survey, and it continues to serve as a valuable research tool.

Each year the Geological Survey increases its impact on the economic and social life of Kansas. Studies of environmental geology affect regional and local planning and the whole construction industry in the recognition of the impact of the environment on all man's activities, especially in urban development. The Survey is becoming more involved with the economic and social implications of mineral development in addition to the technical aspects. Cooperative projects are in progress, with the U. S. Bureau of Mines, to evaluate all aspects of several Kansas mineral resources.

1968 Trends in Mineral Production

A. L. Hornbaker

The value of Kansas mineral production in 1968, estimated at $597,354,000 by the State Geological Survey of Kansas, is a little less than the all-time high, which was reached in 1967 (Fig. 1 and Table 1). Despite the slight decline, there is reason to be optimistic, in view of the increase in the nonfuels commodities, in the aggressive position taken by independent oil operators, and in the confidence of the utilities industry that coal is the best source of low-cost energy for the generation of power.

The total value of the 1968 production, although slightly down from 1967, reflects strength and growth of the nonmetallics industries, all of which posted small

MINERAL PRODUCTION IN KANSAS.....1968

Total...$597,354,000

Estimated 1968 Value

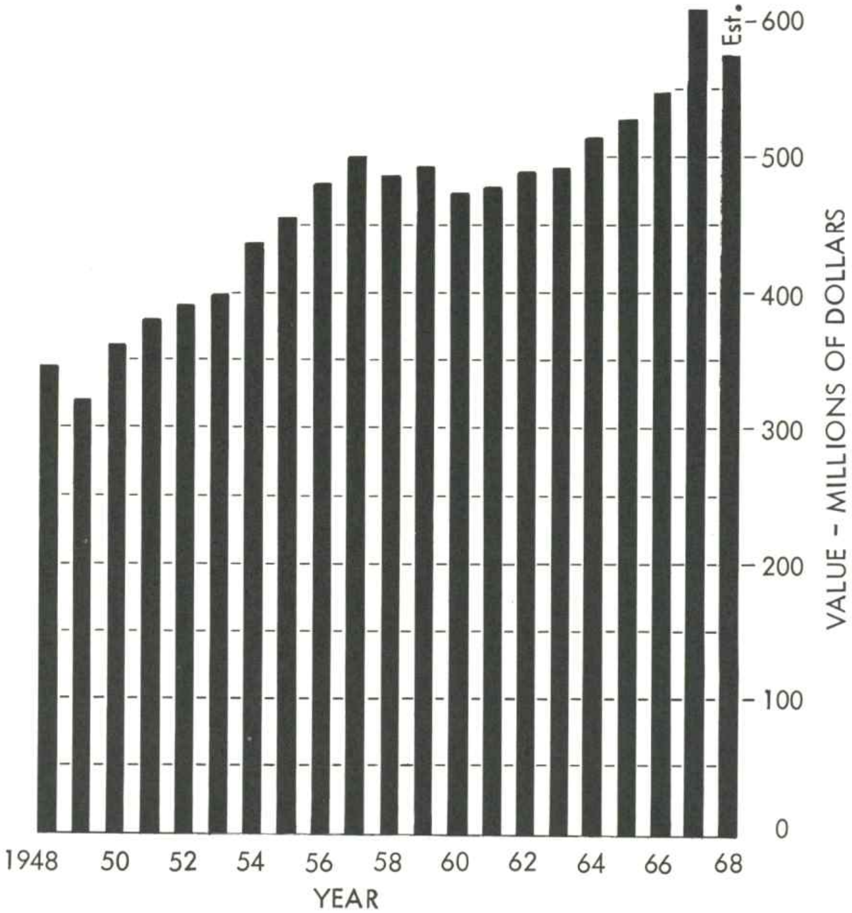

FIGURE 1. Trend of mineral wealth in Kansas, 1948-1968.

to fairly large gains for the year--gains that were great enough to offset the overall loss in total value of commodities contributed by the petroleum industry. The last decade, in fact, has been a time of a gradual decline in crude oil production which is the major contributor to mineral production in Kansas. Were it not for phenomenal growth in production and value of helium during the last 7 years, the total contribution from the petroleum industry would be a much smaller percentage of the total mineral value. As it is, petroleum continues to contribute more than 80 percent of the total mineral value (Table 2).

The increase in the value of mineral commodities was much slower in the decade 1958-1968, averaging 1.6 percent per annum, than during the previous decade 1948-

TABLE 1. Kansas mineral production--1967 final figures and 1968 estimates.

Commodity	Unit	1967 Quantity	1967 Value, $1,000	1968 (Est.) Quantity	1968 (Est.) Value, $1,000
CEMENT					
Portland	thousand 376-lb. bbl.	8,833	25,545	9,800	29,000
Masonry	thousand 280-lb. bbl.	350	1,000	365	1,095
CLAY AND SHALE (raw and products)			10,246		10,100
CRUDE OIL	thousand 42-gal. bbl.	99,200	304,500	94,600	295,100
HELIUM (14.7psia; 70°F)					
Refined	thousand cu. ft.	225,000	5,364	319,000	7,975
Crude	do	2,719,700	32,554	2,865,800	35,976
NATURAL GAS (14.65psia; 70°F)	million cu. ft.	881,139	110,200	866,113	108,265
LIQUID PETROLEUM GASES	thousand gallons	1,153,863	57,000	986,000	48,314
SALT	thousand short tons	1,069	14,686	1,175	16,568
SAND AND GRAVEL	do	12,066	8,650	13,000	9,750
STONE	do	13,551	17,806	14,800	18,940
MISCELLANEOUS (diatomaceous marl, gypsum, carbon black, brine, volcanic ash, coal, lead, zinc)			14,702		16,271
	Total		602,253		597,354

Sources of information: State Geological Survey of Kansas, Kansas Corporation Commission, State Mine Inspector, United States Bureau of Mines.

1958, in which the annual increase was 4.2 percent. Crude oil production, the major contributor, peaked in 1956 and has been steadily declining since. Natural gas and natural gas liquids continued to make fairly strong gains until 1967, but in 1968 they declined for the first time in many years. Of the products included in the petroleum industry, only helium continued to show an increase in 1968.

Nonmetallic minerals contributed about 16 percent of the total value of Kansas mineral production, and more than offset the decline in value of petroleum and petroleum-related commodities. Even though the outlook for the nonmetals is encouraging, they will be hard-pressed to offset the expected gradual but persistent decline of values from the petroleum industry. Increased wildcat drilling and general aggressive attitude of the independent operators may help slow down, or

TABLE 2. Value of minerals produced in Kansas in 1968, listed in order of rank.

Commodity	1968 Estimated values	1968 Percent of total	1968 Percent loss or gain from 1967
Crude oil	$295,100,000	49.4	- 3.1
Natural gas	108,265,000	18.1	- 1.8
Liquid petroleum gases	48,314,000	8.1	-15.2
Helium	43,951,000	7.2	+15.9
Cement	30,095,000	5.0	+13.9
Stone	18,940,000	3.2	+ 6.4
Salt	16,568,000	2.8	+12.8
Miscellaneous minerals (combined)	16,271,000	2.8	+ 6.5
Clay and shale products	10,100,000	1.7	- 1.4
Sand and gravel	9,750,000	1.7	+12.7
Total	$597,354,000	100.0	

could even reverse, the downward trend in production of crude oil which has occurred during the last decade.

Among the nonmetallic minerals or mineral products inventoried, cement registered the largest gain (14 percent) and is the largest contributor at an estimated value of $30,000,000. Despite cutbacks in highway contract awards, some cement plants operated at or near capacity to meet the demands generated by commercial contracts and ready-mix plants.

Stone was second in estimated value among the nonmetallics at $18,940,000, but registered a weaker gain, at 6.4 percent, than either cement or sand and gravel. Weak demand for agricultural limestone accounts, at least in part, for the smaller percentage increase in the value of stone.

Sand and gravel, the other major construction-aggregate material, registered a strong gain of 12.7 percent. The gain in value of sand and gravel, like the gain in value of cement, can be attributed to a strong commercial building market. Clay and shale products, registering a small loss of 1.4 percent, apparently did not respond quite as well to the stepped-up building activity as did cement and sand and gravel.

The salt industry, which for some time has been competing with low-cost salt from the Gulf Coast, found additional market demand for evaporated salt, mainly for use in water softening and feed manufacturing. Value gained is estimated at 12.8 percent.

Miscellaneous minerals registered a large total value because of the necessity of including coal, diatomaceous marl, lime, lead, and zinc in this group in order to avoid disclosure of confidential data. Among this group, coal, carbon black, gypsum (raw and calcined), and brine are the major contributors in order of value. All four commodities gained, but brine registered the largest gain.

Announcement of a new 840,000-kilowatt, mine-mouth power plant jointly owned by Kansas Gas and Electric Company and Kansas City Power and Light Company, with Pittsburg & Midway Coal Mining Company to supply the coal was the big news of the year in the coal industry. A 3,100-acre reservoir will be constructed to provide water for the plant.

As a general rule, growth of the nonmetallic mineral industries seems to be closely correlated with the general economy of the area and especially with contract awards. Although the economy is expected to continue growth, perhaps at a slower rate, the nonmetallic mineral industry needs added stimulus in order to sustain this growth and to offset declines in the petroleum industry. To aid in this stimulus, the Geological Survey is continuing research programs in beneficiation and development of new materials from previously little-used but relatively abundant minerals such as volcanic ash and bentonite. As mentioned previously, one result of the experimental work by the Geological Survey in producing filter aids and insulating material from volcanic ash has been the construction of a $500,000 plant at Mankato, Kansas, by Interpace Corporation of Parsippany, New Jersey. This plant will process volcanic ash and produce filter aids, insulation materials, and a variety of related products.

Recent studies and laboratory tests have proved the quality and value of clay granules made from Kansas bentonite and volcanic ash for use as toxicant carriers, "kitty litter," and absorbents. Additional work points to possible production of reflective glass beads made from a combination of Kansas glass sand, chalk, and volcanic ash.

A healthy mineral industry depends on many things other than demand and the ability to produce a product. Recent developments in local planning and zoning ordinances are inimical to continued mineral exploration and development around urban areas. It is essential that planners and industry cooperate to protect non-renewable prime-mineral resources, especially in metropolitan and rapid-growth areas where construction materials are vital to the very growth that is desired. Both planners and industry must be aware of the problems of a community and of local industry in resolving land-use conflicts. Reasonable and equitable solutions to this problem should be the goal of planners.

Overview of Petroleum Production in Kansas, 1968

Robert Dilts

In 1968 the Kansas petroleum industry was dominated by aggressive, optimistic, independent operators. Drilling operations were 2.4 percent greater than 1967. The increase of 64 tests were wells drilled for exploration. The success ratio for exploratory drilling remained the same as in 1967 at 16.2:1. During 1968 in a 14-state area the total lease holdings dropped by 11 million acres. Kansas records, however, showed an increase in leasing from 1.5 million acres in 1967 to almost 2 million acres during 1968. Two hundred miles of transportation pipeline were added to Kansas systems during 1968.

Kansas crude oil production dropped to 94.6 million barrels with a total value of $295.1 million at $3.12 per barrel. Production in 1967 was 99.2 million barrels with a total value of $304.5 million at $3.07 per barrel. The 5-cent-per-barrel increase in the crude price is not realistic nor is it adequate to sustain the industry-production costs.

More wildcat wells were drilled in 1968 than in 1967. However, the exact number of wildcats drilled cannot be determined because much of eastern Kansas is not adequately scouted. Drilling notices filed with the Conservation Division of the State Corporation Commission increased from 3,641 in 1967 to 3,685 in 1968. Ellis County led the State with 200 wells completed, and was followed closely by

Greenwood County, in which 197 wells were completed. The largest number of wildcat wells were drilled in Sheridan County. However, in spite of the 71 wildcats, only 102 wells were completed.

Independent companies led in completions. Pickrell Drilling Company completed 78 wells and Clinton Oil Company completed 65. Cities Service ranked highest among the majors with 28 completions, earning the position of 18th when compared with all operators.

In 1968, active rigs in Kansas averaged 6 1/2 rigs per month greater than 1967. Rig activity at the close of 1968 was well above the close of 1967 and would have been even higher if rigs and crews had been available. The major limiting factor was the unavailability of crews.

The Kansas Geological Society's Nomenclature Committee listed 164 discoveries during 1968. This figure includes 116 oil field discoveries, 30 new oil pay discoveries in established pools, seven gas field discoveries, seven new gas pay discoveries in established pools and four revival wells. The 1967 list included 108 oil fields, 33 new oil pays, 10 gas fields, 9 new gas pays, and 16 revivals. No pools were declared as officially abandoned by the Committee. This does not indicate that there was production from every pool. The policy of the Committee is to defer abandonment until there has been no production for at least three years.

Eighteen discovery wells were drilled in Ellis County, 10 of which were field-openers. Barton County ranked first in field-openers with 12. Ten field-openers were drilled in Sheridan County causing an extensive lease play. At the close of 1968 more than 240,000 acres were under lease in Sheridan County and undoubtedly more acreage is under lease, but late leasing had not been filed by the close of the year. The leasing activity was started early in the year when the Hoxie West Field was discovered by Koch Exploration Company. Nine additional field discoveries followed in Sheridan County during 1968.

Important Lansing-Kansas City discoveries in Decatur and Rawlins counties opened the following five pools: Paddock, Ung Southwest, Fringer, Elna, and Worpel. The discovery of oil from the Lansing limestone in the Bastin pool has stimulated leasing in Thomas County.

The development of the Brandon pool in eastern Colorado has been an important incentive to western Kansas oilmen for some time. During the middle part of 1968, Mull Drilling Company discovered oil in Mississippian rocks about thirty miles north of the Brandon pool. This discovery has increased leasing activity in several of the westernmost counties of Kansas.

Secondary recovery and pressure maintenance projects accounted for 19.1 percent of the total crude production during 1967. The figure for 1966 was 17.5 percent. Production under such projects increased to 32,366,394 barrels in 1967 from a total of 30,217,329 barrels in 1966. Water injected during 1967 was 335,039,932 barrels, as contrasted with 326,056,667 barrels in 1966. The 1968 statistics are expected to show a continued increase.

A project for thermal recovery of oil from shallow sandstone units in Miami County is proving to be profitable. Operators are planning to expand projects presently in operation and are searching for sites for similar projects.

The Alameda water flood in Kingman County is an outstandingly successful secondary recovery project in western Kansas. For example, Texaco, Inc. operates 15 wells that produced about 280 barrels per day per well during August from the Viola Limestone and the Simpson Group.

The development of new gas reserves during 1968 has been accomplished mostly by extension of known production. The Kansas Corporation Commission has declared the Etna Gas Area to extend southward to the Oklahoma state line. Interest is increasing in "shut-in" gas wells, and the Kansas Corporation Commission is conducting an investigation of the location of these wells. This information will aid companies that are interested in laying gathering lines. Northern Natural Gas Company increased their runs of gas during 1967 by the production of reinstated underage allowables, but these allowables are almost depleted. Cities Service Gas Company increased its pipeline capacities during 1968 and is producing reinstated underage allowables. The pipelines and gathering lines in Harper and Stafford counties are being extended and production will begin from shut-in wells.

The decline in gas production during 1968 was caused by lack of markets for gas transported by Cities Service Pipe Line Company. The other major lines were operating at either the capacity of their lines or the allowables of their wells.

Records show that the major oil companies are doing an ever-decreasing amount of exploratory drilling in Kansas. However, this decrease has been offset by increased exploration by the independent companies. In order to carry out their exploration programs, these independent companies will need a great amount of investment capital that is being generated through stock-type financing. This system is not new but it is being used successfully by several aggressive independent companies of Kansas. It will add millions of dollars to the funds available for drilling in Kansas.

Discovery allowables, unitization, secondary recovery, and the hope of more favorable crude prices are some of the key elements for the Kansas petroleum industry in 1969. With increases in these factors petroleum will remain a major product in Kansas.

Helium--A Century of Progress

Helen Wolfe

Helium is an amazing element. Once it was believed to exist only on the sun, at extremely high, incandescent temperatures. Today it is used to attain temperatures low enough to almost "freeze" molecular motion.

One hundred years ago a young British astronomer, Joseph Lockyer, became deeply interested in the bright froth of light that played on the sun's surface and which occasionally flared into brilliant jets called "prominences." He strongly suspected that the fiery phenomenon was caused by incandescent gases. In 1868, using a spectroscope attached to a telescope, he confirmed his theory. His analysis not only told him which gases composed the solar prominences, but also revealed among them a new element--helium. For a generation, however, the existence of this new element on earth went unsuspected until another Englishman discovered helium in an inert gas which he obtained by treating a uranium-bearing mineral, cleveite, with acid. He found not only the element argon, for which he was searching, but also helium. Then, in 1905 the element was found again, this time by accident, in gas from a shallow well drilled near Dexter, Kansas. Because this gas, unlike most natural gases, would not burn, a sample of it was analyzed by two University of Kansas scientists, Hamilton P. Cady and David F. McFarland. In the course of their analysis they discovered that the gas contained nearly 3 percent helium. The discovery alerted scientists to the fact that helium might exist in relatively substantial quantities in natural gas fields. As a result helium became available in amounts sufficient to permit some fundamental studies of its properties; and, over the years these studies have produced a continuing series of discoveries that have changed helium from a laboratory curiosity to a very important mineral commodity with everyday uses.

For nearly 50 years the U. S. Bureau of Mines has played an important role in the development of helium. This organization first influenced development of helium during World War I, when the military needed to have a nonflammable substitute for the hydrogen used in blimps and dirigibles. This research served to stimulate attempts at producing helium in large quantities. Bureau scientists and engineers, working with skilled technologists from both government and private industry, have tackled the job of designing and building plants to recover helium from gas fields in Kansas, Oklahoma, Texas, New Mexico, and Arizona. Although the war ended before helium from these plants could be used, this was the beginning of much research and technology for large-scale helium production. In 1925, Congress placed all helium-related activities under the jurisdiction of the Bureau of Mines, and until 1961 the Bureau of Mines plants were the Free World's only supplier of helium. In 1961 private industry entered the field and now helium is produced commercially, although by law, producers must contract (long-term) to the Bureau of Mines for conservation purposes.

Helium is extracted from natural gas in three main steps: (1) removal of carbon dioxide and water vapor, (2) liquefaction of almost all constituents present in the gas except the helium, and (3) purification of the partly refined helium by absorption of the impurities on activated charcoal that is cooled by liquid nitrogen. Helium is a colorless, odorless, and tasteless gas and, except for hydrogen, it is the lightest of all gases. Helium has the lowest solubility in water of any known gas. Helium can be liquefied, but it has the lowest condensation temperature of any known element. Under its own vapor pressure, helium is a liquid even at absolute zero. Helium can be frozen by the application of sufficient pressure at a temperature of 1.1°K or below. The lowest pressure at which helium can exist in the solid phase is 25 atm.

Helium forms no chemical compounds in the ordinary sense of the word, although there is evidence that weakly bonded ions with more than one atom can be formed under certain circumstances. The gaseous helium molecule is monatomic.

Of great interest to those who work in the field of cryogenics is the fact that helium forms two different kinds of liquid with distinctive properties. The liquid that exists above the transition temperature is called liquid helium I, and the liquid that exists below this temperature is liquid helium II. The transition temperature at the equilibrium vapor pressure of helium is called the λ-point, and is 2.19°K. Helium is the best heat conductor known and has the lowest viscosity of any known liquid. It forms a thin film over any solid with which it comes in contact, and the liquid creeps through this film to other containers. (For example, if an open-ended container were half submerged in a liquid helium bath, a thin film of helium, 50 to 100 atoms thick, would creep up its outer sides, flow over the open top, and eventually fill the container to the level of the bath.)

For many years, helium was used chiefly as a lifting gas--that is, as a means of raising man above the surface of the earth. In a sense, this is still its major role today, although the type of aircraft has changed from blimps and dirigibles to rockets and spacecraft. Most of the helium now produced is used in the nation's space program, which not only lifts man off the earth's surface, but may carry him to the moon and beyond. Why is helium used in such large volumes by the space program? Helium under pressure forces fuel from the tanks of these rockets into the engines; in addition, helium sometimes serves to pressurize the empty tanks, giving their walls the rigidity needed to prevent collapse. Because helium is so light, it can perform these tasks without adding weight that would reduce the rocket's payload. Because it is inert, there is no danger that it will combine chemically with the rocket fuel, or that it will mix physically with the fuel, because it is insoluble. These particular combinations of properties make helium uniquely suitable for its role in the space program.

A somewhat different combination of properties accounts for the usefulness of helium in shielded arc welding. The element's inertness enables it to protect various metals against contamination by oxygen and other substances in the atmosphere. Such contamination threatens reactive metals like magnesium, aluminum, and titanium when they are exposed to the high temperatures encountered in welding. Blanketing them with inert helium during welding provides a shield through which contaminants cannot penetrate. Another desirable property of helium is that it is an excellent conductor of both heat and electricity. This enables helium to conduct the welding arc more efficiently, permitting it to penetrate deeper into the metal. Before this technique was developed, many metals could not be welded, but had to be joined by riveting, which does not create as strong a bond.

A third major use of helium is as a quality control agent in manufacturing processes. As a leak detector, helium is used to ensure the physical integrity of many different products, particularly refrigeration units. When helium is applied under pressure through the parts of these mass-produced items, it will leak out even the smallest of openings and can readily be detected by instruments. Inertness and good heat conductivity make helium suitable for use in gas chromatography--a sophisticated laboratory technique widely used in quality control.

Perhaps the most "far-out" of the uses for helium is in the new science of cryogenics (super-cold). Liquified helium is the coldest fluid known and can be used to create an environment -452°F or colder--in which other substances undergo strange transformation. In metals, one of these transformations results in superconductivity. At liquid-helium temperatures, metals such as lead, tin, and aluminum lose all resistance to electricity. If an electric current is started flowing through a super-conductor, it will continue to flow even after its source is removed. Although this is relatively new, magnets are being used that are based upon this process. This method could possibly result in more efficient separation of minerals from various ores or substantial increases in efficiency in the generation of electricity. Since atomic movement in electronic devices is associated with "noise," low temperatures can mean high efficiency in detecting and amplifying weak signals that "atomic noise" would otherwise drown out. A helium-cooled maser has enabled Americans to see and hear live television broadcasts from Europe, even though the signal received from the satellite had only one one-billionth of a watt of power.

Helium is also used in other ways. For example, helium-oxygen mixtures are used for treatment of asthmatics; the helium carries the oxygen deeper into the lung passages where it is most needed. Aquanauts increasingly use helium in their oxygen supplies at extreme ocean depths, and nuclear reactors use helium as a heat-exchange medium. Weather research depends heavily on helium-filled balloons and, of course, it still is a "wonder-gas," giving buoyancy and life to the huge cartoon-character balloons used in parades.

In the last ten years, helium has been the resplendent star to the petroleum industry and the mineral industry in Kansas. There are 13 helium plants in the United States, five of which are in Kansas. Three of these plants: Northern Helex Company, Bushton; Cities Service Helex, Ulysses; National Helium Corp., Liberal, although privately built and owned, sell crude helium under long-term contract to the Bureau of Mines for storage in the partially depleted Cliffside gas reservoir, where it will remain until needed in the future. Through this conservation of one of nature's most remarkable elements, its supply is being guaranteed for generations to come. In late 1968, a new helium-extraction plant, jointly owned by Cities Service Gas Company and Kansas-Nebraska Natural Gas Company went on-stream near Scott City. This is the largest commercial unit in the United States and helium extracted here will be sold on the open market. The only other commercial helium plant in the Free World is that of Canadian Helium near Swift Current, Sasketchewan, Canada, which has a capacity of about 36 million cu. ft. per year. The Scott City, Kansas, plant has the capacity to process 225 million cu. ft. of natural gas per day, extracting up to 150 million cu. ft. of crude helium per year, plus 67 million gallons per year of natural gas liquids.

As previously stated, helium is the one bright light in the petroleum industry in Kansas; for example, in 1960 income from crude oil totaled $329 million compared to helium at only $350 thousand. Preliminary estimates for 1968 show crude oil revenue decreasing to a value of $295 million, while helium revenue has increased to $44 million. And we have apparently only begun to tap the potential uses of helium.

Regional Distribution of Energy
in Kansas as Compared to Population

Ronald G. Hardy

Recognizing the need in long-range planning to organize the State into more homogeneous regions, the leadership of Kansas delineated the counties of Kansas into 11 regions (Fig. 2).

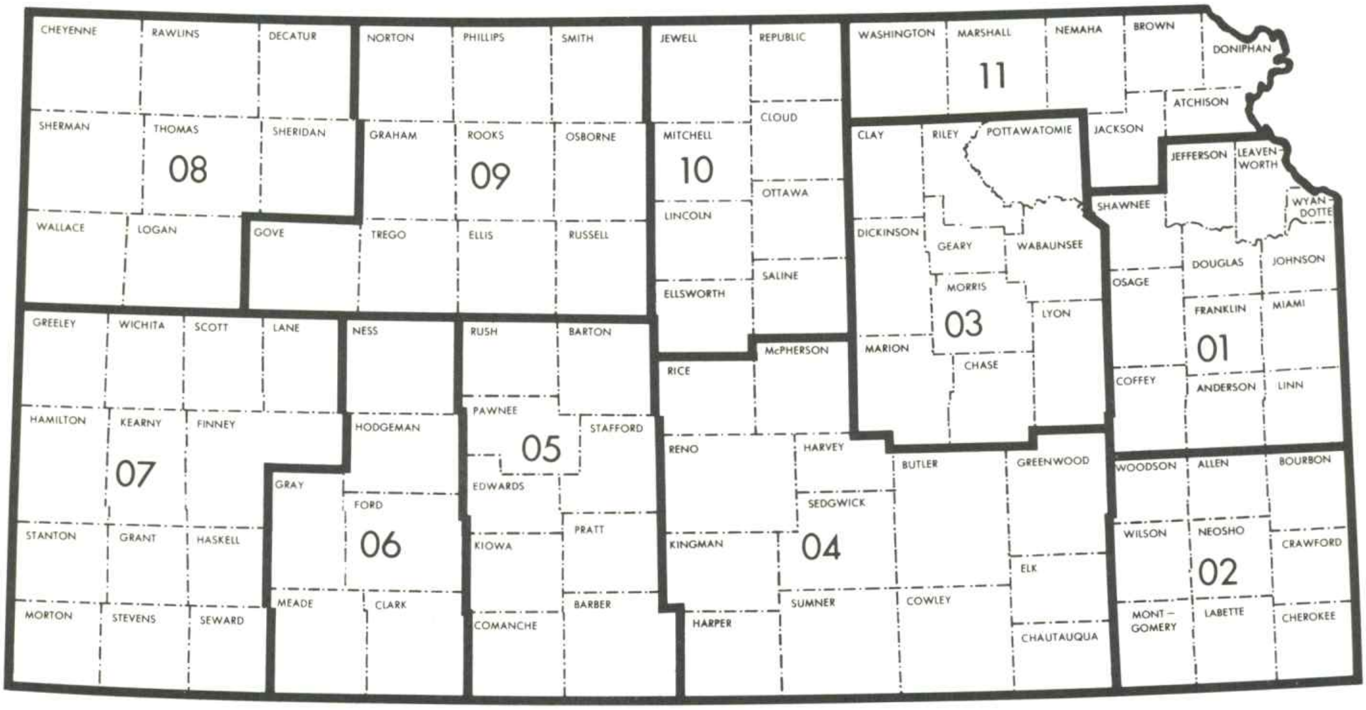

FIGURE 2. Economic regions of Kansas.

As part of an over-all mineral resource analysis, the total energy produced in each region during 1967 is shown in Table 3. The total energy figure (in BTU's) is derived from the sum of the BTU's in crude oil, natural gas, natural gas liquids, and coal. The total population for each region is also shown in Table 3.

The relative magnitude of the energy produced by regions is shown in Figure 3 and the relative magnitude of the population is shown in Figure 4. Obviously, the potential energy represented by the minerals extracted does not correlate with population. These figures emphasize the fact that extraction of an energy resource does not always induce regional population growth. For example, compare regions 01 and 06.

TABLE 3. Regional population and regional energy production in Kansas--1967.

Region	Population (1000)	Energy produced, 10^{12} BTU
01	708	5,699
02	207	17,098
03	157	13,098
04	602	127,844
05	90	105,289
06	45	29,348
07	77	76,252
08	42	5,054
09	91	175,141
10	107	36,661
11	95	584

Energy Conversion in Kansas--The New La Cygne Mine-Mouth Power Plant

Ronald G. Hardy

The cover illustration represents the architects' sketch of the planned 840,000-kilowatt plant to be built near La Cygne, on the Miami-Linn county line in eastern Kansas. This plant will represent a joint $100 million investment by the Kansas City Power & Light Company and the Kansas Gas and Electric Company in an electricity generating station that should be ready for operation early in 1973.

Two features of particular interest to the Kansas mineral industry are (1) the potential use of about 4,000 tons of coal daily, and (2) the fact that the generating station is located near the coal deposits. In other words, this installation is a "mine-mouth plant" where economies will be realized by transmitting energy

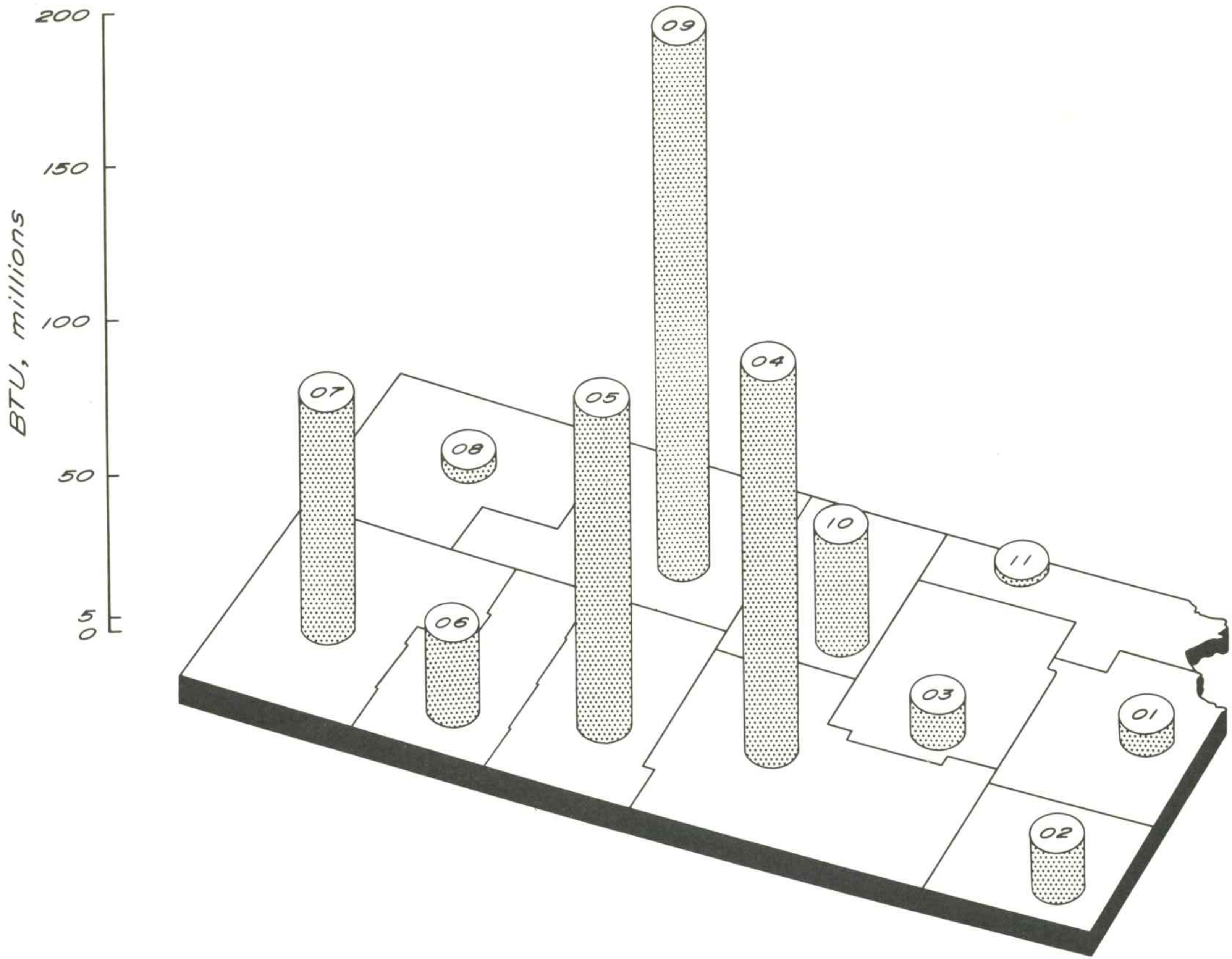

FIGURE 3. Total energy produced in economic regions of Kansas, 1967.

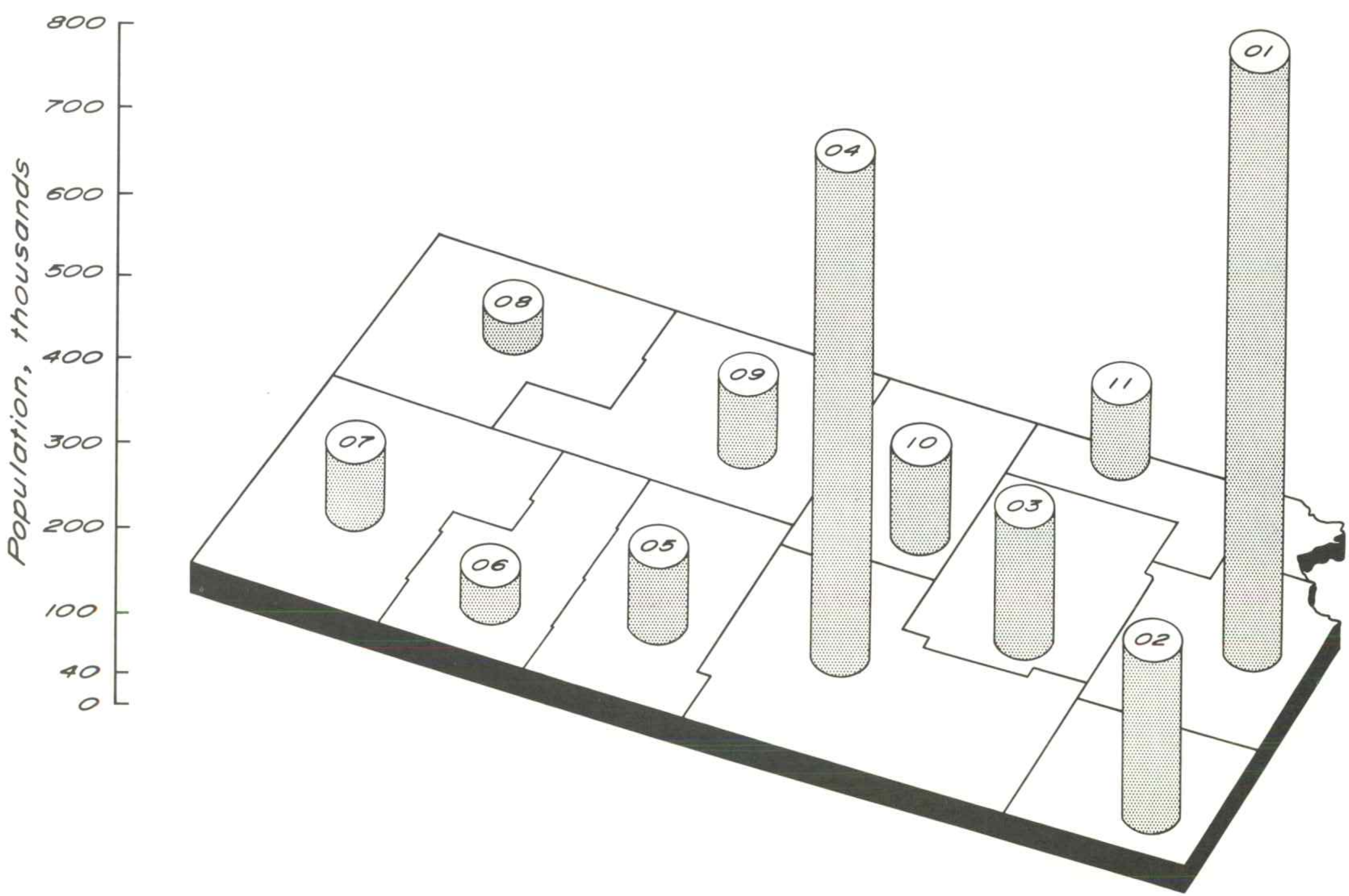

FIGURE 4. Total population in economic regions of Kansas, 1967.

rather than by shipping coal. Coal will be transported to the plant by rail or truck over private right-of-ways. Mining contracts have provisions for reclaiming land after mining is completed, and the plant will be equipped for control of air pollution. Nuclear fuel was considered for this plant, but research indicated that conventional fuels continue to be more economical for power generation in this region.

Availability of water was another important factor in choosing the location for the plant. A major feature of the plant will be a 3,100-acre lake, which will be constructed to furnish water for cooling. The lake will be similar in size to reservoirs at Elk City and Kanopolis, Kansas, and it will be considerably larger than reservoirs at Fall River, Toronto, and Council Grove. Approval for the reservoir has been sought from the Division of Water Resources of the Kansas State Board of Agriculture.

Employment created by the project will include an estimated 150 persons in mining and 75 persons in operation of the plant.

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