

Uranium Section



Courtesy of Petrotomics

Pictured above is the Dave Pit operated by Petrotomics Company, Shirley Basin, Wyoming. Petrotomics Company is comprised of Skelly Oil Company, Kerr-McGee Corporation, and the managing partner, Getty Oil Company. The ore discoveries on this property were first made in 1957 with production and sales of uranium beginning in 1961. The original opening, started in November 1966, was approximately 600 feet wide, 1500 feet long, and averaged 185 feet deep. Some 6 million cubic yards were involved. To date, an additional 2½ million cubic yards have been removed in expanding the pit. Overburden is presently being moved at a rate of about 37,000 tons per day. The feed mill, to the north of the pit, has a capacity of 1,000 tons per day of uranium ore.

The above picture is symbolic of things to come in the uranium mining industry for the state of Wyoming. Subsurface exploration for commercial uranium, while in its infancy, holds great promise for the future with increasing understanding of the modes of occurrences and applications of more sophisticated techniques both of which are discussed in the papers that follow.

Irwin S. Johnson,
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THE NUCLEAR INDUSTRY IN WYOMING - 1968

By
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INTRODUCTION

The increased demand for nuclear power plants is the primary reason for the new uranium rush. The outstanding success of nuclear power reactors in producing large quantities of electric power reliably and cheaply, has produced a growing nuclear power equipment business. The renewed demand for uranium is also caused by the broadening use of radioactive isotopes in such fields as food preservation and medicine.

Nuclear electric generating capacity in the U.S. is expected to grow at an average annual rate of 38 percent over the period 1965-80. The demand for U_3O_8 in this country is expected to increase from about \$100 million a year in 1968 to about \$450 million a year by 1980. By 1990, uranium mining and milling should be a billion dollar business and one of the larger segments of the metal mining industry in this country.

Although a number of nuclear power plants have been in existence since 1962, the uranium industry has

kilowatts). The Atomic Energy Commission estimates that by 1980 installed nuclear power capacity in the United States probably will be about 150,000 megawatts. Plants built or now on order will require about 175,000 tons of U_3O_8 for fuel throughout their lifetime. Those which are projected to be in service by 1980 will be on the same basis requiring an additional 500,000 tons.

HISTORY OF WYOMING URANIUM BUSINESS

Uranium ore was first discovered in Wyoming in 1918, but it was not until 1951 that mineable qualities of the ore were located in the Pumpkin Buttes area of Campbell County. Actual mining operations were started in 1953. Further discoveries were made in other areas of the state such as the Gas Hills, Shirley Basin, and Crooks Gap between the years 1952 and 1955. Spurred by the Atomic Energy Commission, the uranium industry received assistance in various forms from government agencies during these years.

Until 1956 the production of uranium in the state was the result primarily of preliminary exploratory effort. With new areas being located and new processing plants being constructed each year, the industry expanded rapidly. By 1958, uranium ore was second to petroleum in the

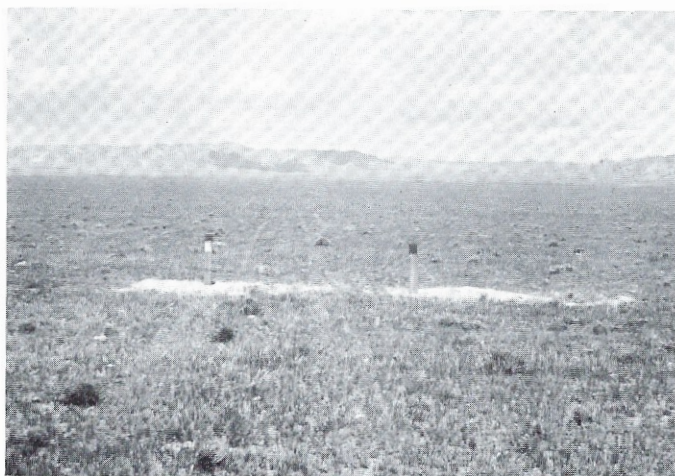


Fig. 1.—Claim posts—a common scene on the Wyoming landscape.

not been able to benefit directly, because up to 1964, only the Federal Government could own nuclear reactor fuels. In 1964, however, the United States Congress enacted legislation to change all of this. The stage was set for the gradual and complete withdrawal from the uranium business by the Federal Government. From 1964 to June 1967, nuclear powered generating equipment installed or on order had reached a total of 39,000 megawatts (39 million

TABLE I
URANIUM PRODUCTION IN WYOMING: 1955-1965

Year	Number of Operations	Ore Mined (Short Tons)	U_3O_8 Contained (Pounds)	F.O.B. Mine Value
1955	108	41,365	182,030	\$ 722,011
1956	145	156,509	702,882	2,764,730
1957	122	274,699	1,189,947	4,668,681
1958	145	651,790	3,282,698	13,285,634
1959	111	864,582	4,337,433	17,609,564
1960	106	1,357,225	6,740,180	27,386,975
1961	79	1,521,064	7,091,427	28,217,633
1962	79	1,301,784	6,386,210	25,715,360
1963	69	1,173,420	5,892,232	23,848,690
1964	70	1,183,754	5,890,321	23,320,533
1965	66	1,048,176	4,560,625	17,758,394

Source: U.S., Department of the Interior, Bureau of Mines, *Minerals Yearbook*, 1957-1964.

value of production. By 1961 Wyoming was the second largest producer of the ore in the United States next to New Mexico. Uranium production data for Wyoming from 1955 to 1965 are shown in Table I. The most productive year for the uranium industry on both the state and national level was 1961 when the value of ore produced in Wyoming reached \$28,217,633.

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Fig. 2.—A close-up of claim posts (4x4) with validation holes on the side and certificate of location bored into the post.

The AEC purchases were scheduled to terminate in 1966; however, in 1962, the AEC announced a "stretch-out" procurement program. Under this program, producers who were under contract to supply uranium to the AEC up to the 1966 cut-off date were allowed to defer a portion of their production until 1967-68. In return for this deferment, the AEC guaranteed that it would purchase a matching amount of uranium in 1969-70. The stretch-out action was taken to bring AEC procurement closer in line with requirements and also to help the domestic uranium industry make the transition from a government defense market to a civilian power market.

In 1965, total production of uranium ore in Wyoming was valued at \$17,758,395. The first substantial order from private enterprise for Wyoming uranium oxide concentrate came in early 1966. The sale was made by Utah Construction to a Swiss utility company. The value of Wyoming's uranium production in 1966 was \$18,197,000. In 1967, preliminary estimates of the value of Wyo-

ming uranium production are approximately \$35,000,000. The reflection of the demands of private power utilities for Wyoming uranium is evident in the 1967 valuation. Table II gives a current run-down of announced sales to date of ore from Wyoming mills. Private sales of uranium oxide concentrate plus the concentrates sold and delivered to the AEC during 1968 should push total value of Wyoming uranium production over \$40,000,000.

CURRENT EXPLORATION ACTIVITY

The result of this tremendous upsurge of the uranium industry has been to swing the pendulum back to the favorable side again for Wyoming exploration. See figure 6 for an index map of areas of concentrated uranium exploration effort. Most of the activity so far has been in the Wind River Basin, Shirley Basin, and the southern part of the Powder River Basin. Several areas within the Green River Basin, such as the South Pass and Red Desert areas have also had an increase in uranium exploration activity. The initial impact has been a flurry of land acquisition. In addition to acquiring land, exploring com-



Fig. 3.—Strong-back boys with pick and shovel is still the best method of setting discovery posts.

TABLE II
PRIVATE SALES OF URANIUM

Company/Seller	Sold To	Amount	Delivery Date
Utah Construction—Lucky Mc.....	Nordostschweizerische Kraftwerk A.G.....	750 thousand pounds.....	Completed, 1967
Western Nuclear.....	Philadelphia Electric.....	300 thousand pounds.....	Completed this spring
Western Nuclear.....	Public Service Elect. of Philadelphia.....	500 thousand pounds.....	Completed this spring
Utah Construction—Lucky Mc.....	Oskarshamnsværkets Kraftgrupp Aktiebolag.....	765 thousand pounds.....	85 per cent complete
Federal-American Partners.....	Babcock and Wilcox, Virginia.....	\$4.8 million.....	New thru Sept., 1970
Utah Construction—Lucky Mc.....	Nordostschweizerische Kraftwerk A.G.....	\$3,250,000.....	1969
Utah Construction—Lucky Mc.....	General Electric.....	1.7 million pounds.....	1969-1970
Union Carbide.....	Westinghouse.....	4 million pounds.....	May, 1970-1973
Federal-American Partners.....	Combustion Engineering.....	\$9 million.....	1970-1971
Union Carbide.....	Northern States Power, Minneapolis.....	700 thousand pounds.....	Begin 1970
Western Nuclear.....	Westinghouse.....	One million pounds.....	1970
Utah Construction—Lucky Mc.....	Sacramento Municipal Utility District.....	1,100 thousand pounds.....	1971
Western Nuclear.....	Combustion Engineering.....	3½ million pounds.....	1971-1973
Utah Construction—Lucky Mc.....	General Electric.....	5 million pounds.....	1971-1975
Utah Construction—Lucky Mc.....	General Electric.....	One million pounds.....	1972

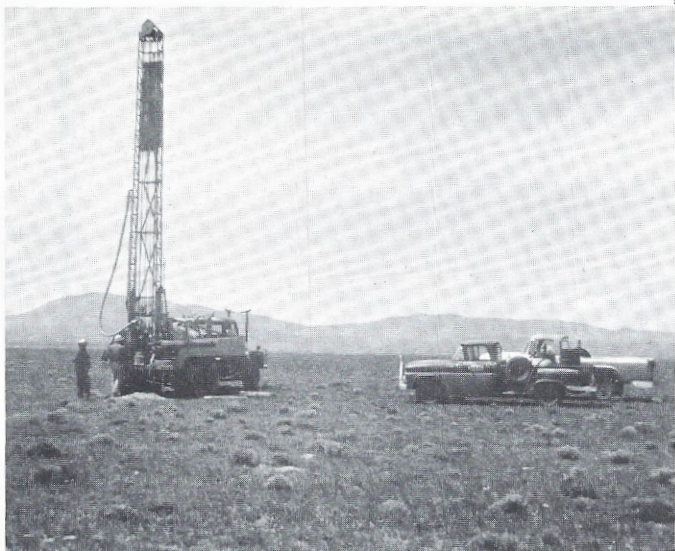


Fig. 4.—Validating claims, a common activity on the Wyoming prairie.

panies have accelerated their drilling activities. Producing companies have placed a particular emphasis on the proving up of indicated reserves.

In the Gas Hills-Crooks Gap mining district, more than 40 million pounds of uranium oxide have been produced since 1954 for a total worth of about \$320,000,000. It is estimated that there is still 50,000,000 pounds of U_3O_8 left in the Gas Hills-Crooks Gap area. Another 20 to 30,000,000 pounds of U_3O_8 can be expected to be found in the Gas Hills-Crooks Gap area through extension of known trends. This means that when mining is over, the Gas Hills-Crooks Gap area will have produced over \$1 billion worth of uranium over a 25 to 30 year period.

The Shirley Basin, as yet, has not developed as fast as the Gas Hills-Crooks Gap area. Petrotomics is believed to have issued orders for the complete delineation of its reserves. These vast reserves continue to be extended to the north and to the west, and there is no sign yet that the trends have been fully delineated. Some estimates of the value of the ultimate mineable reserves of yellow uranium oxide in the Shirley Basin has been as high as \$2 billion dollars.

Besides extension of known ore bodies, additional reserves have been found in relatively new areas. These new areas have been discovered as a result of this new up-



Fig. 5.—The ultimate goal, a similar uranium pit as is being mined in the Gas Hills area.

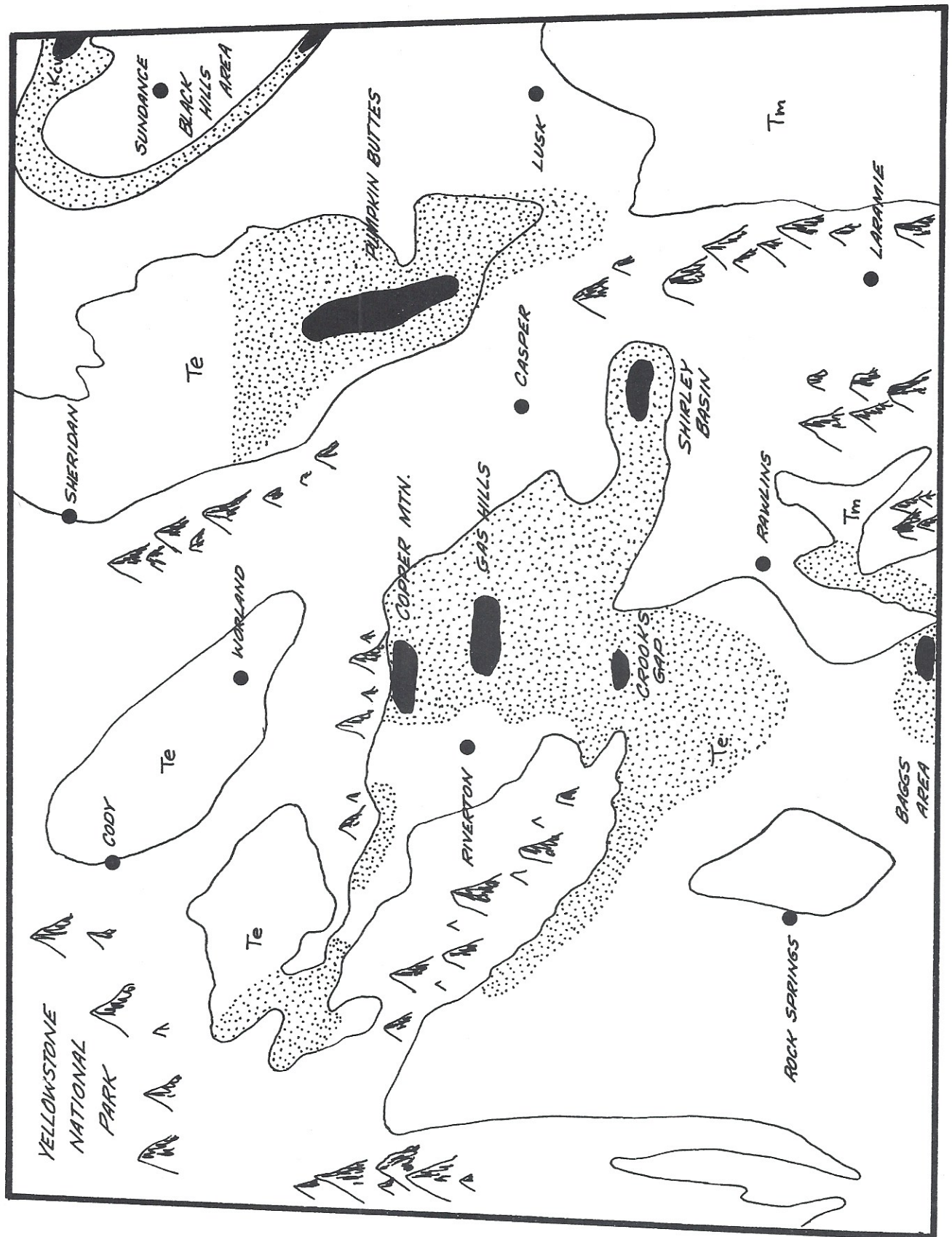


Fig. 6.—Index map of Wyoming showing mining areas in black and areas of concentrated uranium exploration activity stippled.

surge in uranium interest. Consolidated Oil and Gas has announced a low grade ore body in the Poison Spider area east of the Gas Hills and north of the Rattlesnake Range. A new substantial ore body has been reported in the Green Mountain area southeast of Crooks Gap. New ore has also been found on the Farson side of South Pass. On the northern edge of the Wind River Basin in the Copper Mountain area, new reserves have been found. An old mining district, the Powder River Basin, has been given a new prominence by intense drilling activities. Kerr-McGee has recently said that they have begun a feasibility study to determine building a mill in the city of Douglas, Wyoming.

Exploration is underway on the Wind River Indian Reservation and in the Muskrat-Hiland-Clarkson area north of the Gas Hills. South of the Gas Hills on Beaver Rim, there is exploration to determine if the ore bodies in the Gas Hills area continue southward. Miller Hill in Carbon County is getting renewed exploration interest. Much drilling should begin in the Split Rock syncline in the Sweetwater area of Fremont, Natrona, and Carbon Counties this summer. In the Red Desert area, south of Crooks Gap to Wamsutter through the Union Pacific right-of-way, all the criteria for a good uranium area are present. Most of this area has been staked, and there have been rumors of discoveries ranging in depth from 300 feet to 1000 feet. Uranium exploration activity is occurring also on fringes of the Shirley Basin and on the flanks of the Granite Mountain range in the sedimentary rocks between the Gas Hills and Crooks Gap mining complex. In the Black Hills area of Wyoming and South Dakota where Homestake produces uranium from the Hauber mines near Hulett, new ore bodies have been defined and exploration has been revived.

Almost every major energy company in America is active in the search for uranium in Wyoming—the longtimers like Utah Construction, Western Nuclear, Union Carbide, Federal Resources, American Nuclear, Continental Uranium, Western States Mining, Allied Nuclear (Shoni Uranium), Western Standard Uranium, Atlas Corporation, Kerr-McGee, Homestake, Vipont Mining, Getty Oil, Mines Development, Teton Exploration, and others, and the relative newcomers like Cleveland-Cliffs, Newmont, United Nuclear, Gulf Nuclear, Climax, Atlantic-Richfield, Humble, Consolidated Oil and Gas, Sinclair, Rio Algom of Canada, Mitsubishi Metals of Japan, King Resources, Continental Oil, W. R. Grace Co. and Silver Bell mines (in the Red Desert), Union Pacific, American Smelting and Refining, General Nuclear, Elcor Chemical and others.

FUTURE EXPECTATIONS

Most experts think that Wyoming uranium will command about 40 percent of the future uranium market be-

tween now and 1980, and some believe that with this accelerated rate of discoveries Wyoming could produce 50 percent of future uranium sales to domestic and foreign sources. If we assumed that Wyoming would get 50 percent of the uranium sales market between now and 1980, as the Riverton Ranger reported in their recent edition (June 20, 1968, Sec. 7A, page 9), these sales could reach \$2.2 billion in value. In a "Confidential Report" by the Stanford Research Institute on the future of uranium, the annual sale value for U_3O_8 was estimated to be \$450 million by 1980. If Wyoming could capture 50 percent of this market, it would mean an annual business take of \$225 million for the state.

This is the opportunity and the challenge that presented itself to the Wyoming uranium explorationist. Uranium is common in the earth's crust, and Wyoming sedimentary and tectonic history is ideally suited for uranium deposition. The opportunity is upon us now. The challenge is to find needed uranium to furnish the energy to keep this country great. The bonus is profit and a part in a multi-billion dollar industry of the future.

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