REVIEW OF COPPER INDUSTRY IN 1964

REVIEW BASED ON PRELIMINARY STATISTICS PUBLISHED

BY U. S. BUREAU OF MINES

BY FRANK J. TUCK, CONSULTANT

ARIZONA DEPARTMENT OF MINERAL RESOURCES, FRANK P. KNIGHT, DIRECTOR

MARCH, 1965

COPPER IN 1964

REVIEW BASED ON PRELIMINARY STATISTICS PUBLISHED BY U.S. BUREAU OF MINES

By Frank J. Tuck, Statistical Consultant, Arizona Department of Mineral Resources

The U. S. Bureau of Mines' preliminary estimate of recoverable copper production from U. S. mines in 1964 was 1,244,000 tons, up only 2.5% from the final figure of the 1963 production of 1,213,166 tons. The Copper Institute's estimate of the 1964 production was 1,251,475 tons.

Based on an estimated annual capacity of 1,400,000 tons of mine recoverable copper in 1962, the 1964 preliminary estimate of the U. S. Bureau of Mines was about 88.9 percent of capacity.

In response to a strong demand which began to accelerate in late 1963, rates of domestic copper production increased through the first half of 1964, and after being impeded by strikes in the third quarter, resumed their upward impetus in the final quarter. New record highs were established in U. S. and world mine production, in domestic smelter and refinery outputs from primary materials, and production of refined copper from secondary sources. Reflecting similar actions abroad, producers' prices for electrolytic copper in the United States rose twice during the year and closed at 34 cents a pound. In July, dealers' prices in the United States and spot prices on the London Metal Exchange began to rise above producers' prices and almost doubled by October. As a result of short supplies caused by production or transportation problems, some major producers in the United States and abroad invoked "force majeure" on orders and rationed copper to customers.

Output averaged 120,000 tons monthly in January-June, but fell to 75,000 tons in July and August as a result of strikes and vacations. Production turned upward in September and reached 115,000 tons in October. Production in Arizona rose 4 percent to a new record and the State supplied 55 percent of the national total.

Despite a strike of almost 3 months' duration, Utah remained in second place and contributed 16 percent of the total. Montana regained third place with production exceeding 105,000 tons, the highest in two decades. As a result of strikes at some mines that adversely affected production, output from Michigan dropped 8 percent, from Nevada 15 percent, but was almost unchanged in New Mexico.

Production of copper by Arizona mines, 687,400 tons, amounted to 55.3% of the total U. S. production in 1964. Utah was second with 201,850 tons; Montana third with 104,600; New Mexico fourth with 88,700 tons; Nevada fifth with 69,750 tons; Michigan sixth with 68,950 tons. These were all based on preliminary estimates by the U.S.B.M.

Preliminary estimates of Free World copper production in 1964 consisted of 1,244,000 tons for the U.S.A. and 2,813,000 tons in the rest of the Free World. Copper production in Communist controlled countries is not known, but it is believed to have been at least 750,000 tons. The total World mine production for 1964 is therefore estimated at 4,807,000 tons, as compared with an estimated production of 4,460,000 tons in 1963.

The Free World mine production of 4,057,000 tons amounts to 92.2 percent of an estimated Free World capacity of 4,400,000 tons.

The U. S. Bureau of Mines reported U. S. producers' refined copper stocks at the beginning of the year at 52,000 tons and 37,000 at the end of the year. The Copper Institute, which differs from the Bureau's figures by including refined copper in process, reported 76,934 tons at the beginning of the year and 45,594 tons at the end of the year, 1964.

United States refined copper production in 1964 was reported by the U. S. Bureau of Mines at 1,260,000 tons of domestic copper and 396,000 tons of foreign copper, or a total of 1,656,000 tons. This includes an estimated 352,000 tons of secondary unalloyed copper. The Copper Institute reported a total refined production of 1,794,430 tons, which includes 1,251,475 tons of U. S. mine production, 147,696 tons of secondary and 380,259 tons of foreign copper.

According to the U. S. Bureau of Census, U. S. imports of copper in 1964 amounted to 52,012 tons in ore, matte and regulus, 389,577 tons of blister, and 137,757 tons of refined ingots, bars, etc., total 579,296 tons; as compared with 49,384 tons in ore, matte and regulus, 369,061 tons blister, and 119,165 tons refined, total 537,610 tons in 1963. Copper exports in 1964 amounted to 5,415 tons of copper in ore, concentrates and matte, and 316,230 tons of refined ingots, bars total 321,645 tons; as compared with 1,210 tons of copper in ore, concentrates and matte, and 311,479 tons of refined ingots, bars, etc., total 312,689 tons in 1963. The net excess of imports in 1964 was 257,651 tons, as compared with 224,921 tons in 1963.

Apparent comsumption of new refined copper in the United States in 1964 was estimated by the Bureau of Mines at approximately 1,526,000 tons, while the actual consumption was estimated at 1,809,000 tons, while the actual consumption was estimated at approximately 1,707,000 tons in 1963.

Attached hereto is Table I, giving a summary of the U. S. Copper Industry Preliminary Statistics for 1964, and Final Figures for 1963.

TABLE I

SUMMARY OF U. S. COPPER INDUSTRY PRELIMINARY COPPER STATISTICS FOR 1964

COMPARED WITH FINAL FIGURES FOR 1963

Unit: Short Tons
Source: U. S. B. M.

	Final 1963	Prelim. 1964
Mine production of New Cu from U.S. ores	1,213,166	1,244,000
Ref. Prod. of New Cu from U.S. ores	1,219,342	1,245,000
Ref. Prod. of New Cu from Foreign ores	377,009	393,000
Total Ref. Prod. of New Copper	1,596,351	1,638,000
Imports of Refined Copper	119,165	137,707
Stocks at Beginning of Year	71,000	52,000
Total Available Supply	1,786,516	1,827,707
Exports of Refined Copper	311,479	316,230
Refined Stocks at End of Period	52,000	34,000
Total	363,479	350,230
Withdrawn on Domestic Account (Apparent Consumption)	1,423,000	1,477,000
Actual Consumption	1,744,000	1,809,000
Imports of Ores, Matte and Regulus (Copper Content)	49,384	52,012
Imports of Blister Copper	369,061	389,577
Imports of Refined Copper	119,165	137,707
Total Imports of Crude & Refined	537,610	579,296
Exports of Ores, Concts., Matte (Copper Content) .	1,210	5,415
Exports of Refined Copper	311,479	316,230
Total Exports of Crude & Refined	312,689	321,645
Excess Imports of Crude & Refined	224,921	257,651
Secondary Copper Recovered as Unalloyed Copper. .	315,000	352,000

Arizona Department of Mineral Resources March, 1965

O U T L O O K

James Boyd, Copper Range Co. president, recently named as "Copper Man of the Year 1964", addressed an "Investment Outlook Conference" and has been quoted in the American Metal Market of January 20, 1965, as foreseeing the copper industry on the threshold of stability.

Mr. Boyd said the current copper shortage should end within the next few months. He stated that steadily increasing worldwide production will soon be in balance with the increasing demand for the metal.

Mr. Boyd also told the conference that it should not be misled by the current high prices for copper on the London Metal Exchange and the New York Commodity Exchange. "Actually less than 15% of the copper supply is bought through these markets; most of the copper goes directly from the producers to the copper user." U. S. producers' price of copper is 34 cents a pound.

"The current copper shortage", Mr. Boyd said, "is due to labor strikes and political unrest in some of the copper producing countries. Well over 90% of the world's mines are now back in full production, so supply should catch up to demand within the next few months."

In outlining a promising future for the copper industry, Mr. Boyd said that the industry is now more active than ever in developing new uses for copper. He said the industry has nothing to fear from possible use of other metals as a substitute for copper.

"Copper is the oldest of the metals which have been utilized by man; the Bronze Age Antedated the Iron Age by many thousands of years. In recent years, glamorous materials such as aluminum and plastics have been used as substitutes for copper, and yet the consumption of copper in the world has been doubled since World War II."

Mr. Boyd cited his own company, Copper Range, as an example of the progress and growth of the Copper industry. In its White Pine mine in the upper peninsula

of Michigan, Mr. Boyd said that "recent geological surveys and core drilling show that the ore reserves at White Pine probably account for well over 10% of the total known U. S. copper reserves of a high enough grade to be profitably mined."

The Copper Range president said his company has spent the past few years working on developing new uses for Lake copper and new approaches to marketing. "Copper Range is steadily increasing production at White Pine, and new mining techniques may make it possible for the company to begin a major expansion of production in the future."

KENNECOTT'S MILLIKEN VIEWS COPPER'S FUTURE

Frank R. Milliken, Kennecott president, in a letter to stockholders said, "Our customers both here and abroad expect their business to be strong in the first half of the current year." He added:

"An apparent easing of the tight copper supply situation is evidenced by recent lower prices on the metal exchanges. For example, the London Metal Exchange price, which was as high as 65¢ per pound in December, 1964, is now down to 42¢. This is still materially above our prices in the United States and in Europe."

"Kennecott expects its business for the first half of 1965 to be good."

Mr. Milliken also commented about the agreement between Kennecott and the Chilean Government to form a new corporation to take over the assets and operations of Kennecott's Braden Copper Co. Mr. Milliken said that a bill submitted to the Chilean Congress by the President of Chile would authorize the President to enter into this proposed agreement.

Anaconda Copper Co. also has been negotiating a similar agreement between Chuquicamata and the Chilean Government. As a result, a 700,000 tpy increase in Free World capacity has been forecast within the next four years by Asarco's Simon Strauss. Chile will be a strong force to be reckoned with in the future. President Frei has announced that output in Chile will be pushed from the present

rate of 617,000 metric tpy to 1.1 million tpy by 1970.

The Engineering and Mining Journal has made a Project Survey reporting "conditions that come closest to matching today's galloping activity in the post World War II-Korean war era when pent-up consumer appetites demanded more copper, badly needed by the government for defense. One important feature, however, sets present project activity apart from the war-born demand of the early 1950's. Anticipated future growth in mineral production capacity is pretty well spread across the full spectrum of commodities and not confined to a few 'critical' items."

PRESENT AND FUTURE COPPER PRODUCTIVE CAPACITY

Following is this Department's estimate of the annual copper production capacity, as reported by the Arizona Department of Mineral Resources and the estimate made by a Project Survey conducted by the Engineering and Mining Journal, and reported in the Journal's issue of January 1965, showing their estimate of increase in capacity from 1962 to the end of 1969.

TABLE II

ESTIMATED ANNUAL COPPER PRODUCTIVE CAPACITY

ARIZONA, UNITED STATES, OTHER FREE COUNTRIES, COMMUNIST COUNTRIES

	TONS COPPER EST. By Arizona Dept. Mineral Resources End of 1961	EST. BY ENG& MINING JOURNAL Increase 1962-1969	TONS COPPER Est. at End of 1969
ARIZONA:			
Morenci	140,000		
New Cornelia	72,000		
Copper Queen	35,000		
Lavender Pit	38,000		
Sub-Total	285,000	15,000	300,000
Ray	72,000		72,000
Miami-Copper Cities	35,000		35,000
Inspiration	47,000	10,000	57,000
San Manuel	82,000	10,000	92,000
Magma	24,000	5,000	29,000
Silver Bell	20,000		20,000
Pima	18,000		18,000
Bagdad	12,000		12,000
Duval (Esperanza & Ithaca Peak(after 1964)	30,000	25,000	55,000
Mission	45,000		45,000
Miscellaneous	30,000		30,000
Sub-Total (Arizona)	700,000	65,000	765,000
OTHER STATES:			
Utah (Utah Copper	225,000	100,000	325,000
Montana (Butte)	130,000	60,000	190,000
Nevada (Ely & Yerington)	95,000	5,000	100,000
New Mexico (Chino)	100,000	15,000	115,000
Michigan (White Pine & Cal. & Hecla)	80,000	20,000	100,000
Miscellaneous	70,000	70,000	140,000
Sub-Total (Other States)	700,000	270,000	970,000
GRAND TOTAL - UNITED STATES	1,400,000	335,000	1,735,000
OTHER FREE COUNTRIES:			
Canada	500,000	164,000	664,000
Chile	650,000	550,000	1,200,000
Peru	205,000		205,000
Western Europe	140,000		140,000
Asia	240,000	50,000	290,000
Africa	1,100,000	186,000	1,286,000
Australia	100,000	70,000	170,000
Other Countries	65,000	65,000	130,000
Sub-Total - Free Countries other than U.S.	3,000,000	1,085,000	4,085,000
GRAND TOTAL - ALL FREE COUNTRIES	4,400,000	1,420,000	5,820,000
Communist Countries	800,000	200,000	1,000,000
GRAND TOTAL - WORLD	5,200,000	1,620,000	6,820,000

Arizona Department of Mineral Resources March, 1965

MINERAL INDUSTRY SURVEYS

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Stewart L. Udall, Secretary **Marling J. Ankeny, Director**

Robert W. Geehan, Area Director, Area V
Mineral Resource Office
224 New Customhouse
Denver, Colorado 80202

Area Report
(Preliminary)

MINERAL PRODUCTION IN ARIZONA IN 1964

PRELIMINARY ANNUAL FIGURES

Arizona mineral production in 1964 increased $40.9 million (8.5 percent) over that of 1963. According to the Bureau of Mines, United States Department of the Interior, the preliminary total value for 1964 was $522 million, $40.9 million more than in 1963 and $37 million over the record high established in 1956.

This significant advance, 8.5 percent, resulted from increases of $40.6 million for the metals group to a total of $480 million, and $298,000 for the fuels group to $2 million. The value of the nonmetal mineral commodities declined $73,000 from $40.1 million reported in 1963. An increase of $38.3 million in the output of copper was the primary reason for the increased value of metals production as a group and the total value of all minerals produced in the State.

METALS

Production of copper was 26,423 short tons greater in 1964 because of increased output at most of the larger copper mines. The total value of copper produced increased at a significantly higher rate because of a higher average annual price of 32.4 cents per pound in 1964 compared with 30.8 cents in 1963. In 1956, the previous record high-value year, copper sold at an average annual price of 42.5 cents per pound. A 10-week strike, called by the United Steelworkers of America in July, idled Ray Mines Division, Kennecott Copper Corp., Hayden and Ray.

Prepared by Leonard P. Larson, Physical Scientist, under the supervision of Donald H. Mullen, Project Coordinator, Mineral Resource Office, Area V, January 4, 1965, in cooperation with the Arizona Bureau of Mines.

TABLE 1.--Mineral production in Arizona[1/]

Mineral	1963		1964 (preliminary)	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays[2/]--thousand short tons--	163	$203	171	$222
Copper (recoverable content of ores, etc.)--short tons--	660,977	407,162	687,400	445,435
Diatomite--do--	(3/)	(3/)	500	15
Gem stones--	(4/)	120	(4/)	120
Gold (recoverable content of ores, etc.)--troy ounces--	140,030	4,901	150,000	5,250
Lead (recoverable content of ores, etc.)--short tons--	5,815	1,256	6,240	1,660
Lime--thousand short tons--	181	3,048	177	3,000
Mercury--76-pound flasks--	(3/)	(3/)	72	22
Molybdenum (content of concentrate)--thousand pounds--	5,553	7,584	6,278	9,278
Natural gas--million cubic feet--	1,334	161	1,700	200
Petroleum (crude)--thousand 42-gallon barrels--	68	(3/)	65	(3/)
Pumice--thousand short tons--	800	1,877	746	1,630
Sand and gravel--do--	15,036	14,466	14,700	14,100
Silver (recoverable content of ores, etc.)--thousand troy ounces--	5,373	6,873	5,780	7,473
Stone--thousand short tons--	3,257	5,069	3,223	5,003
Uranium ore--short tons--	150,584	4,844	99,400	3,196
Vanadium--do--	222	(3/)	210	(3/)
Zinc (recoverable content of ores, etc.)--do--	25,419	5,846	25,450	6,872
Value of items that cannot be disclosed: Asbestos, cement, clays (bentonite and fire clay), feldspar, gypsum, helium, iron ore, mica (scrap), perlite, pyrites, and values indicated by footnote 3--	----------	5 6/17,705	----------	7/18,507
Total--	----------	5/481,115	----------	521,983

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Excludes bentonite and fire clay; included with "Value of items that cannot be disclosed."
3/ Figure withheld to avoid disclosing individual company confidential data.
4/ Weight not recorded.
5/ Revised figure.
6/ Value of metals and mineral fuels, $2,360,000; value of nonmetals, $15,345,000.
7/ Value of metals and mineral fuels, $2,542,000; value of nonmetals, $15,965,000.

Mines in Arizona yielded 6.3 million pounds of molybdenum in 1964, 13 percent more than in 1963. Silver output gained 8 percent in quantity and 9 percent in value, as the average annual weighted price rose from $1.27912 per troy ounce in 1963 to $1.29293 in 1964. More than 75 percent of the silver production was derived as a byproduct from the refining of copper produced in the State by the major copper producers; 25 percent was produced from lead-zinc and miscellaneous ores. Byproduct gold from copper refining increased 7 percent in quantity and value.

Production of uranium ore declined 51,200 tons (34 percent); the average grade of ore processed was approximately the same as in 1963. The Orphan mine, on the rim of the Grand Canyon, was the largest producing mine in the State. Uranium ores, from Apache County, containing significant quantities of vanadium oxide, were processed at the Vanadium Corporation of America mill at Shiprock, N. Mex., for recovery of the vanadium. The quantity recovered from ores of Arizona origin was 5 percent below that recovered in 1963.

Several new, significant developments occurred in Arizona's copper industry during 1964. Duval Corp. completed pre-mining stripping of waste overburden and constructing a 12,000-ton-per-day concentrator at Mineral Park, near Kingman. Milling operations were begun in November, and all milling facilities were in operation by the end of the year. The first shipment of copper concentrates from the plant was delivered by company truck to the Atchison, Topeka & Santa Fe Railway Co. at Kingman for shipment by rail to the Hayden smelter of American Smelting and Refining Co.

On April 15, The Anaconda Company exercised its option to lease, finance, and operate mining properties of Banner Mining Co. in Pima County. Banner was to share about equally on a net-profit basis in the production from the area. As a preliminary development of its first porphyry-type open-pit mine in Arizona, Anaconda began sinking a three-compartment 900-foot verticle exploration shaft to confirm assay results of its drilling program in the area and to obtain bulk samples for metallurgical testing. Depth of the overburden was reported to range from 200 to 500 feet. The agreement between Anaconda and Banner included provisions for constructing concentrating facilities with a minimum daily capacity of 15,000 tons of ore.

Inspiration Consolidated Copper Co. reported that newly installed equipment increased treatment capacity at the Inspiration mill, from 16,500 to 20,000 tons per day. The additional capacity permitted the exploitation of lower grade ores, with the consequent lengthening of the open-pit mine, without lowering the present rate of copper output. The company reported that production at the Christmas mine attained designed capacity of 4,000 tons per day.

Superior Division, Magma Copper Co., suspended operations from January 12 to January 30, following a fire which damaged crusher, conveyor, and other equipment. Lower sales resulted from the need to restore inventories to more nearly normal levels. Plans were made to increase productive capacity at the San Manuel Division by 12 percent, or an estimated 10,000 tons of refined copper per year. The $11.8 million improvement program, expected to require 18 months to 2 years to complete, included constructing a new primary ore-crushing plant and additions to the concentrator. The program was to increase the daily mine capacity from 35,000 to 39,000 tons.

Phelps Dodge Corp. received a patent for the Dos Pobres group, 118 mining claims covering 2,190.5 acres of land located in T 5 S, R 26 E, approximately 10 miles northeast of Safford. The patent was the largest single mining patent for multiple mining-lode claims issued by the Federal Bureau of Land Management. The corporation had no plans for the immediate development of the claims. The new resource was of importance in measuring future copper-mining activity at the corporation Morenci Branch.

Phelps Dodge Corp. abandoned plans to drill an 8-mile water-transmission tunnel in favor of a 30-inch pipeline under the Mogollon Rim from Blue Ridge Dam to the East Verde River. The water transferred by the pipeline was to be exchanged for water drawn from the Black River for use in the company Morenci concentrator. The project implemented an exchange agreement between Phelps Dodge Corp. and the Salt River Irrigation Project in central Arizona.

Continental Materials Corp. announced plans to develop, for production in 1966, a copper-zinc ore body in the Twin Buttes district 15 miles south of Tucson. Discovered by diamond drilling, the ore body occurred at reported depths of between 500 and 1,000 feet. Because of the depth, the ore was to be mined by underground methods. Shaft sinking at the property was scheduled to begin early in 1965.

United Nuclear Corp., Santa Fe, N. Mex., test drilled a group of copper claims in the Lone Star mining district in Graham County. The property included 50 claims in the Lone Star group and 40 claims in the Esperanza group held under option, in addition to 20 claims located by United Nuclear. The company reported that the test drilling disclosed a low-grade copper deposit.

The Colorado Fuel and Iron Corp. (CF&I) leased two tracts of land totaling 5,120 acres from the White Mountain Apache tribe for developing known iron ore deposits. The two tracts are approximately 10 miles west of Cibecue. CF&I planned to develop the iron deposits to augment the iron ore supply of its Pueblo plant in Colorado. Heretofore, the Colorado plant received its iron ore from company-owned mines at Sunrise, Wyo., and Cedar City, Utah.

NONMETALS

Nonmetallic mineral production (sold or used) in 1964 was valued at $40.1 million and represented 7.7 percent of the total value of mineral production in the State. Growth in cement sales was the primary factor in maintaining the nonmetallic mineral sector of the State economy at the 1963 level; the values of output for sand and gravel, pumice, stone, pyrite, lime, asbestos, and mica declined significantly. Increased values of output were reported also for gypsum, miscellaneous clay, perlite, and bentonite and fire clay.

American Sand and Rock Co., a subsidiary of California Portland Cement Co., began producing precast, prestressed, hollow-core, machine-extruded concrete slabs at its new Phoenix plant on April 6. The company produced sand and gravel from pits near Phoenix.

Duval Corp. reported that exploratory drilling in the Supai salt basin in Apache and Navajo Counties had disclosed the presence of potash mineralization. Potash was reportedly found in the Permian bed 1,000 feet below the surface. United States Borax & Chemical Corp., Kern County Land Co., and National Potash Co. also engaged in exploratory drilling in the same area.

MINERAL FUELS

Crude petroleum production declined 4 percent below that of 1963. The decline was more than offset by a 27-percent increase in natural gas production.

A total of 39 wells was drilled during the first 10 months of 1964, compared with only 12 during the same period in 1963. Wildcat drilling almost doubled, increasing from 11 wells in 1963 to 21 in 1964. Only 1 of the 21 wildcats drilled through October 1964 resulted in a producing well (gas); whereas 2 of the 11 wildcats drilled through October 1963 resulted in producing wells (1 oil and 1 gas).

Two well completions in adjoining States increased interest in drilling prospects in Arizona. The first was the Texota well in the Eagle Springs field, Nye County, Nevada. Completed in 1963 for an initial production of 760 barrels of oil a day, the Texota well focused interest on relatively unexplored areas of Nevada and Arizona. The second was the discovery of oil by Tenneco Oil Co. early in 1964 in the Kaiparowits basin of southern Utah. The discovery was approximately 45 miles north of the Arizona State line.

Southern Pacific Pipeline Co. was laying a 12-inch, 300-mile products pipeline from El Paso (Tex.) to Tucson.

Output of helium from helium-bearing gases from the Pinta Dome field increased 20 percent in quantity and value over that of 1963. All of the production came from the Kerr-McGee Oil Industries, Inc., plant located near Navajo. A helium liquefier was installed, and the first shipment of liquid helium was made in March. The Kerr-McGee helium facility was to continue marketing gas as well as liquid helium. The plant had supplied a predominantly West Coast market with gaseous helium since operations were begun in December 1961.