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Protection Agency

Office of Air Quality
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NC 27711

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Air

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Economic Impact Analysis for the Proposed Primary Copper Smelting NESHAP

Office of Air Quality Planning and Standards
Clean Air
OAQPS

FIGURES

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SECTION 1

INTRODUCTION

The U. S. Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS) is compiling information on primary copper smelting as part of its effort to develop National Emission Standards for Hazardous Air Pollutants (NESHAP) under Section 112 of the 1990 Clean Air Act. The NESHAP is scheduled to be proposed in 1997 and the Innovative Strategies and Economics Group is responsible for developing an economic impact analysis in support of the evaluation of impacts associated with the regulatory options considered for this NESHAP. This report analyzes the economic impacts of the NESHAP.

Primary copper smelting falls under the Standard Industrial Classification (SIC) code 3331, Primary Copper Smelting and Refining. Primary Copper includes establishments primarily engaged in the smelting of copper from copper ore and in the refining of copper by electrolytic or electrowinning processes. According to the 1995 Annual Survey of Manufactures, in 1992 SIC 3331 employed 5,600 people, and produced products valued at $8,660.9 million. Production of primary smelter products in 1995 was valued at $3,168.6 million. The U.S. primary copper industry is concentrated in the southwestern U.S., in Arizona, New Mexico, Texas, and Utah. Within SIC 3331, copper smelting is classified as product class code 33311.[1,2]

This report is organized as follows. Section 2 includes a detailed description of the smelting process. Section 3 describes the characteristics, uses, and consumers of copper smelting products as well as substitution possibilities. Section 4 discusses the organization of the industry and provides facility-level and company-level data. In addition, small businesses are reported separately for use in evaluating the impact on small businesses to meet the requirements of the Small Business Regulatory Enforcement and Fairness Act (SBREFA). Section 4 also contains market-level data on prices and quantities and discusses trends and projections for the industry. Section 5 describes the costs of complying with the NESHAP, and Section 6 estimates facility-specific impacts of complying.

SECTION 2
THE SUPPLY SIDE

Copper smelting is part of the primary copper production process. Primary copper production starts with mining of copper ore having copper content of only 1 percent to 2 percent and ends with commercial grade copper that is 99.99 percent pure. This NESHAP covers only a part of the primary copper production.

2.1 PRODUCTION PROCESS, INPUTS, AND OUTPUTS

Two basic production processes are used to produce pure copper from copper ore: smelting and solvent extraction-electrowinning (SX-EW). Ore is mined with less than 1 percent copper content. It is then concentrated at the mining site into a concentrate having approximately 20 percent copper. Also included in the concentrate are sulfur, iron, and a number of impurities that are hazardous air pollutants (HAPs), including arsenic, lead, cadmium, cobalt, manganese, nickel, selenium, antimony, beryllium, and mercury. Copper concentrate is the input to the smelting process.

Under the traditional smelting process, shown in Figure 2-1, the concentrate is shipped to the smelter, blended, dried, and fed to the smelting furnace. Both slag and matte copper are tapped from the bottom of the furnace every few hours. The slag is disposed of and the matte copper

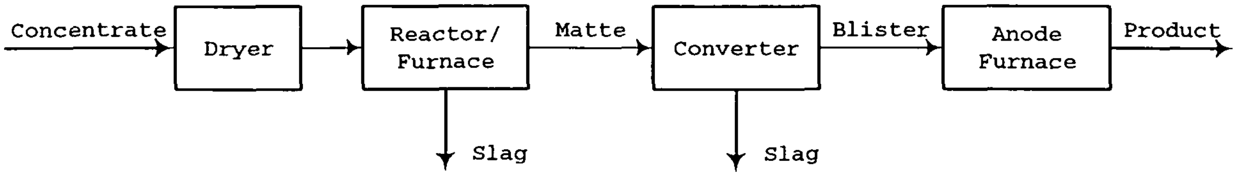

Figure 2-1. Primary copper production.

(now typically over 50 percent copper) is charged to the converters. The converter operation continues to remove sulfur, iron, and other impurities and produces blister copper, which is at least 95 percent copper. The blister copper is charged to the anode furnaces, where further refinement takes place. The anode copper, now 99.5 percent pure copper, is cast in copper anodes. Copper anodes are the output of the smelting process.

SX-EW is an alternative method of producing purified copper from oxidized ores. In this process, a solution of sulfuric acid is poured over the copper concentrate, leaching the copper out of it. Then electrically charged pure copper ions are attracted out of the solution to a charged copper cathode. Currently, approximately 30 percent of copper is produced using SX-EW; the rest is produced using the traditional smelting process.

The copper anodes are then taken to an electrolytic refining plant, where 99.99 percent commercial grade copper is produced. The Primary Copper Smelting NESHAP includes only the smelting operations and does not include the mining, concentrating, or electrolytic refining operations.[3]

2.2 TYPES OF PRODUCTS AND SERVICES

Primary copper smelting is a single part of the copper production process, which produces a single product: 99.9 percent pure copper, which can then be refined and fabricated.

2.3 MAJOR BY-PRODUCTS, CO-PRODUCTS, AND SUBSTITUTION POSSIBILITIES

The copper smelting process generates slag (waste materials remaining after the copper is concentrated and converted). In addition, smelters generate air emissions. The HAPs emitted from primary copper smelters consist primarily (approximately 80 percent by mass) of compounds of lead and arsenic. Other metallic HAP emissions include compounds of antimony, beryllium, cadmium, chromium, cobalt, manganese, mercury, nickel, and selenium. Sulfur dioxide is another by-product or co-product of the smelting process. The sulfur dioxide is captured and converted to sulfuric acid at all the smelters in co-located acid plants.

Input substitution possibilities are limited. Scrap copper can be substituted for the matte copper in charging the converter. In addition, another production process, SX-EW can be substituted for the traditional smelting process for oxide ores and secondary sulfide ores. It is not suitable for primary sulfide ores, however, which predominate in many U.S. mines.[4]

2.4 COSTS OF PRODUCTION AND PLANT SIZE EFFICIENCY

According to the 1995 Annual Survey of Manufactures, SIC 3331 had a value of shipments of $8,660.9 million; major types of cost incurred in this producing the commodities valued are (1) payroll ($254.1 million), (2)materials ($6,858.4 million), and (3) new capital expenditures ($179.7 million). As shown in Table 2-1, materials have historically been the major cost of production in this industry.[5]

TABLE 2-1. PRIMARY COPPER, SIC 3331: VALUE OF SHIPMENTS AND COST OF INPUTS, 1982-1992

Year	Wages ($\$10^6$)	Cost of Materials ($\$10^6$)	New Capital Expenditures ($\$10^6$)	Value of Shipments ($\$10^6$)
1995	254.1	6,858.4	179.7	8,660.9
1994	238.9	4,719.4	702.7	6,185.1
1993	199.6	4,527.3	312.8	5,596.0
1992	188.6	4,598.7	195.5	5,578.2
1991	152.5	2,987.0	110.3	3,898.1
1990	145.5	3,216.2	95.5	4,201.2
1989	119.0	3,315.8	44.5	4,146.8
1988	110.5	3,122.5	NA	3,825.4
1987	97.8	2,177.1	33.6	2,556.9
1986	116.7	1,847.0	13.8	2,065.0
1985	149.7	1,795.8	42.5	2,239.1
1984	181.1	2,532.0	187.7	2,753.3
1983	203.7	2,763.1	272.5	3,467.0
1982	216.9	2,630.9	112.8	3,077.5

NA = not available

Source: U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. 1992 Census of Manufactures: Industry Series, Smelting and Refining of Nonferrous Metals and Alloys, Industries 3331, 3334, 3339, and 3341. Washington, DC, Government Printing Office. 1995. Table 1a, Historical Statistics for the Industry, p. 33C-7.

2.5 PRODUCTION FACILITIES AND LOCATIONS

Seven facilities, owned by five companies, produce primary copper in the U.S. These facilities and their locations are shown in Table 2-2.

TABLE 2-2. PRIMARY COPPER PRODUCERS

Plant	Location
ASARCO, Inc.	El Paso, TX
ASARCO, Inc.	Hayden, AZ
BHP, Inc.	San Manuel, AZ
Cyprus Miami Mining Corp.	Claypool, AZ
Kennecott Utah Copper Corp.	Magna, UT
Phelps Dodge	Hidalgo County, NM
Phelps Dodge-Chino	Hurley, NM

2.5.1 Plant Descriptions

According to Daniel Edelstein, the U.S. Geological Survey's copper expert, production capacity at U.S. smelters in 1996 totaled approximately 1.7 million short tons.[6] EPA gathered data on production capacity in 1992 through an Information Collection Request sent to the facilities. Reported capacity and production in 1992 are shown in Table 2-3.[7]

The 1995 Minerals Yearbook reports several increases in production or capacity relative to these data. Total national primary copper smelter production in 1995 is reported as

TABLE 2-3. ANODE COPPER PRODUCTION AND CAPACITY, 1992

Plant	Capacity (tons/year)	1992 Production (tons/year)
ASARCO-El Paso	133,000	107,787
ASARCO-Hayden	>210,093	210,093
BHP, Inc.	>368,000	370,913
Cyprus Miami	256,800	104,290
Kennecott	160,000	156,934
Phelps Dodge-Hidalgo	232,237	181,283
Phelps Dodge Hurley	215,000	148,000
Total	>1,688,136 (1993) >1,838,136 (1995)	1,360,661

Source: U.S. Environmental Protection Agency. Final Summary Report Primary Copper Smelters National Emission Standard for Hazardous Air Pollutants (NESHAP). Research Triangle Park, NC, U.S. Environmental Protection Agency. July 1995. p. 45.

1,364,000 tons. Smelter production from scrap in 1995 was 393,800 tons, and total smelter production was 1,760,000 tons.

Asarco reported that production at its El Paso smelter increased to 115,000 tons in 1995. Phelps Dodge's Hidalgo smelter produced 224,000 tons of anode in 1994. Cyprus Miami's smelter produced 172,000 tons in 1995. Conversely, Kennecott's installation of a new flash furnace was plagued by successive startup problems, including the failure of a cooling element in the flash converter and failure of the heat recovery system at the acid plant. Consequently, production in 1995 declined 40 percent from already depressed 1994 levels.[8]

In a recent teleconference, Daniel Edelstein of the U.S. Geological Survey, provided information on 1996 capacity at U.S.

smelters. Mr. Edelstein also stated that, with the exception of Kennecott's smelter, all the smelters were operating at or near their design capacities. The smelter capacities are reported in Table 2-4.[9]

TABLE 2-4. ESTIMATED ANODE COPPER CAPACITY, 1996

Smelter	1996 Capacity (tons/year)
ASARCO-El Paso	126,500
ASARCO-Hayden	220,000
BHP, Inc.	374,000
Cyprus Miami	198,000
Kennecott	310,200
Phelps Dodge-Hidalgo	242,000
Phelps Dodge Hurley	187,000
Total	1,657,700

Source: Telecon. Edelstein, Daniel, U.S. Geological Survey, with Jean Domanico, Research Triangle Institute. October 9, 1997.

In addition to data provided by Mr. Edelstein, 1995 production data for four smelters was obtained from publicly available sources.[10,11,12] These data show a range of capacity utilization ranging from 88 percent to 99.6 percent, with a median capacity utilization rate of 95.1 percent. To estimate 1996 production for all smelters except Kennecott, the Agency assumed that these four smelters operated in 1996 at the same capacity utilization rates as they had in 1995. The other two smelters that are major sources are assumed to operate at the median capacity utilization rate, 95.1 percent. These capacity utilization rates are multiplied by the production capacities reported in Table 2-4 to estimate 1996 production. Mr. Edelstein reported that Kennecott was operating well below 50 percent of capacity. Because the Kennecott smelter is an area source, it will not be directly impacted by the regulation. Therefore, no production estimate was made for Kennecott. The resulting estimates of smelter copper production for 1996 are shown in Table 2-5.[13,14,15,16]

TABLE 2-5. ESTIMATED SMELTER COPPER PRODUCTION, 1996

Smelter	1996 Production Capacity (tons)	Estimated 1995 Capacity Utilization (Percent)	Estimated 1996 Production (tons)
ASARCO-El Paso	126,500	99.6[a]	126,000
ASARCO-Hayden	220,000	88.0[a]	193,500
BHP, Inc.	374,000	98.4[b]	368,000
Cyprus Miami	198,000	95.1	188,258
Phelps Dodge-Hidalgo	242,000	92.6[c]	224,000
Phelps Dodge Hurley	187,000	95.1	177,800
Total	1,347,500		1,279,094

Sources: Production capacity: Telecon. Edelstein, Daniel, U.S. Geological Survey, with Jean Domanico, Research Triangle Institute. October 9, 1997.
Capacity Utilization: Based on 1996 capacity and 1995 production from
[a] ASARCO facilities: ASARCO World Wide Web site. <http://www.pmx.com/Clients/Asarco/AnnualReport/copperbusiness.html>.
[b] BHP World Wide Web site. <http://www.bhp.com.au/usa/usopc1.html>.
[c] Edelstein, Daniel. Copper. Minerals Yearbook 1995. Reston, VA, U.S. Geological Survey. <http://minerals.er.usgs.gov/minerals/pubs/commodity/copper/240495>. 1997. p. 3 and Table 1, Salient Copper Statistics.

Thus, the Agency estimates that 1996 production at U.S. smelters (exclusive of Kennecott) was approximately 1.3 million tons of anode copper.

SECTION 3
THE DEMAND SIDE

Copper is widely used in industrial and consumer applications. Its major use is in building construction for plumbing and electrical wiring. Demand for copper fluctuates in response to changes in demand for the products it is used to produce. Output of primary copper producers is consumed almost entirely by copper fabricators. Copper fabricators, in turn, operate brass mills, wire mills, foundries, and powder plants. Fabricators produce copper and copper alloy mill and foundry products, such as electrical wire, strip, sheet, plate, rod, bar, mechanical wire, tube, forgings, extrusions, castings, and powder. These products are sold to a variety of users: chiefly the construction industry, manufacturing industries, and the government. Some mill products, such as wire, cable, and tubular products, are used without further modification. Most flat-rolled products, rod, bar, mechanical wire, forgings, castings, and powder go through forming, machining, finishing, and assembling operations before emerging as finished products.[17]

3.1 PRODUCT CHARACTERISTICS

Copper is valued largely because of its electrical conductivity and resistance to corrosion. Because of its conductivity, it is widely used for electrical wiring and in electronic and electrical equipment. Because of its resistance to corrosivity, it is widely used to carry water and natural gas and for roofing and sheathing applications.

3.2 USES AND CONSUMERS

An average family in the U.S. uses approximately 420 pounds of copper per year. The majority of this copper is used in wiring, plumbing, and automobiles.[18] Copper use in automobiles has increased from 30 pounds in 1981 to 50 pounds in 1991. Similarly, because of larger houses having more bathrooms per house, the amount of copper used in an average house increased from about 280 pounds in the 1970s to about 450 pounds in the 1990s.

Table 3-1 shows the shares of U.S. consumption of refined copper and scrap by copper fabricators by product.[19] In 1992, wire mill products accounted for 75 percent of total consumption of refined copper.

TABLE 3-1. U.S. CONSUMPTION OF REFINED COPPER AND COPPER SCRAP BY PRODUCT, 1992

Product	Percent
Wire mill products	75
Brass mill products	23
Other industries	2
Total products	100

Source: U.S. Department of Commerce. U.S. Industrial Outlook, 1994. Washington, DC, Government Printing Office. 1994. p. 13-7.

Table 3-2 shows U.S. copper consumption by various end-use markets in 1992.[20] Building construction, chiefly plumbing equipment and electrical wiring, accounts for more than 40 percent of total consumption.

TABLE 3-2. U.S. END-USE MARKETS FOR COPPER AND COPPER ALLOY, 1992

Product	Percent
Building construction	40.5
Electrical and electronic products	24.4
Industrial machinery and equipment	13.5
Transportation equipment	11.6
Consumer and general products	10.0
Total	100.0

Source: U.S. Department of Commerce. U.S. Industrial Outlook, 1994. Washington, DC, Government Printing Office. 1994. p. 13-7.

3.3 TRENDS IN CONSUMPTION

Overall, world consumption of copper is expected to grow, as China and other developing countries become more industrialized. China, the world's leading copper importer, was estimated to consume 775,000 metric tons of copper in 1995, a decrease from its 1994 imports of 950,000 metric tons. Because China is increasing its production of refined copper, its imports of copper cathode are expected to decline, while its imports of copper concentrates may continue to increase.[21]

U.S. consumption of copper fell during the period 1989 to 1991, then grew in 1992 and 1993, as shown by Table 3-3.[22] In

TABLE 3-3. COPPER MILL PRODUCTS CONSUMPTION BY END USE (million pounds)

Sector	1989	1990	1991	1992	1993
Building and construction	2,806	2,692	2,603	2,707	2,864
Electrical and electronic products	1,640	1,668	1,530	1,648	1,632
Industrial machinery	968	892	830	884	882
Transportation equipment	791	747	708	740	832
Consumer and general products	660	621	619	604	606
Total	6,865	6,620	6,290	6,593	6,816

Source: Copper Development Association. In Standard and Poors, Industry Surveys. New York, Standard and Poors Corporation. January 1996. Volume 2, M-Z, Copper 1995. p. M81-M86.

1994, it grew by 13 percent relative to 1993. It was predicted to grow by 3 to 4 percent in 1995, due to slower housing starts.

SECTION 4
INDUSTRY ORGANIZATION

The market for refined copper is international. The U.S. is the second largest producer of mine copper, after Chile. Together, the two countries accounted for approximately 44 percent of world copper production in 1995. The U.S. was the largest producer and consumer of refined copper in 1995. Japan and Taiwan were the largest importers of U.S. refined copper, accounting for 59 percent of U.S. refined copper exports in 1995.

4.1 MARKET STRUCTURE

Copper smelters are owned by vertically integrated copper producers, which also own mines and refineries. In most cases, the smelters are co-located with mines and/or refineries. The seven copper smelters in the U.S. are owned by five companies, one of which is an Australian company. This small number of domestic suppliers of refined copper suggests that the markets for smelted copper may be oligopolistic. Under this market structure, producers are aware of each other's existence and overall behavior. Production and pricing decisions are made based on competitors' assumed responses. Market characterization is complicated by the fact that much of the output of U.S. smelters is not marketed; rather, it is consumed to produce final products by refineries and manufacturing operations owned by the same parent company.

4.2 MANUFACTURING PLANTS

As noted in Section 2, seven smelters operated in the U.S. in 1996. Table 2-2 provides the smelter names and locations. Figure 4-1 smelting operations in the southwestern U.S. Smelters are located in New Mexico (2), Arizona (3), Texas (1), and Utah (1). As noted above, Kennecott Copper in Bingham, Utah is a minor source of air emissions regulated under this NESHAP. For this reason, it is omitted from the tables which discuss estimated production, sales, and economic impacts throughout the remainder of this report.

Table 4-1 gives 1996 employment information for each of the smelters, along with estimated production (described in more detail in Section 2).[23]

As mentioned in Section 2, all of the smelters affected by this regulation were operating at or near design capacity in 1996.

Because of the continued strong demand for copper resulting from a strong domestic economy, all of the facilities are expected to continue to operate at or near design capacity. The major uses for copper include construction (e.g., wiring, plumbing) and electronics. Because inventories are not excessive, production is expected to continue at or above 1996 levels into 1997.

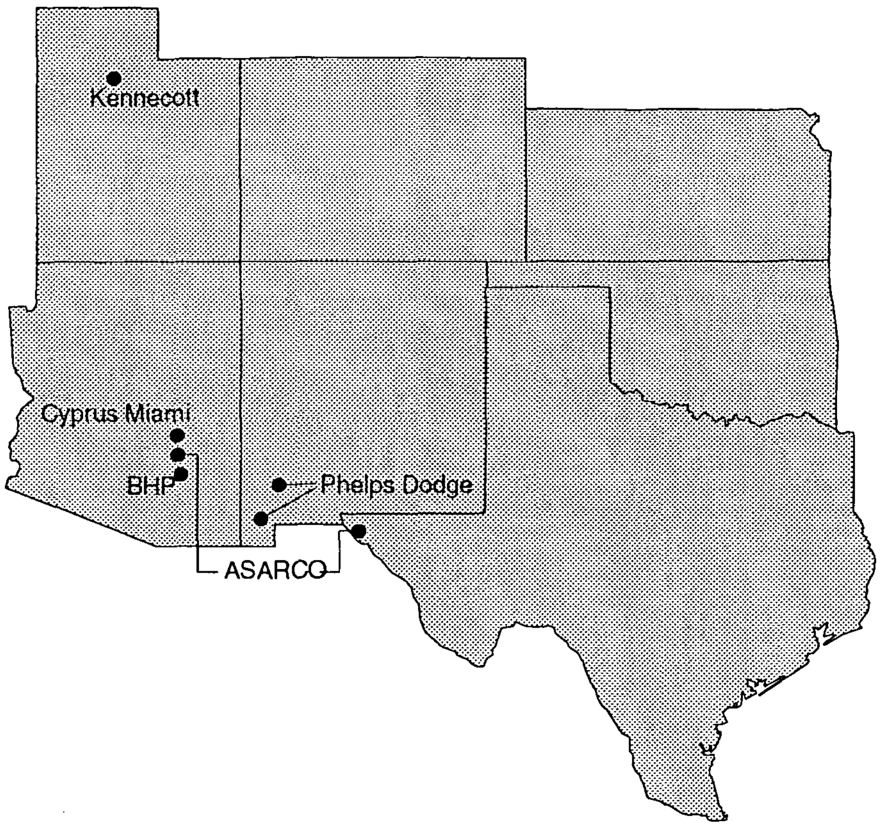

Figure 4-1. Smelter names and locations.

Sales of refined copper produced at each smelter were estimated by multiplying the estimated production of refined copper by the 1996 average price of refined copper cathode, 109.044 cents per pound (see Table 4-2).[24] The estimated sales are based on the smelters' total estimated 1996 production of refined copper, even though much of the smelters' output is not sold but is used by the same company.

TABLE 4-1. U.S. COPPER SMELTING FACILITIES: PRODUCTION AND EMPLOYMENT

Smelter	Location	Estimated 1996 Production (tons/year)	1996 Employment
ASARCO, Inc.	El Paso, TX	126,000	450
ASARCO, Inc.	Hayden, AZ	193,500	1,658
BHP, Inc.	San Manuel, AZ	368,000	1,000
Cyprus Miami	Claypool, AZ	188,258	993
Phelps Dodge	Hidalgo, NM	224,000	500
Phelps Dodge	Hurley, NM	177,800	550
Total		1,274,558	5,651

Source: Dun and Bradstreet. Dun's Market Identifiers. On-line database, accessed through EPA's National Computation Center computer, FINDS system. October 1997.

TABLE 4-2. ESTIMATED SMELTER SALES OF REFINED COPPER

Smelter	Location	Estimated Refined Copper Sales[a] (10^6 \$1996/year)
ASARCO	El Paso, TX	274.79
ASARCO	Hayden, AZ	422.00
BHP, Inc.	San Manuel, AZ	802.56
Cyprus Miami	Globe, AZ	410.57
Phelps Dodge	Hidalgo, NM	488.52
Phelps Dodge	Hurley, NM	387.76

[a] Sales estimates are based on production estimates, which vary based on capacity utilization rates and 1996 production capacity. Estimated 1996 production was multiplied by the 1996 average producers price of refined copper, $1.09044 per pound.

Source: Edelstein, Daniel. Mineral Industry Surveys. Copper in January 1997. Reston, VA, U.S. Geological Survey. April 1997. <http://minerals.er.usgs.gov/minerals/pubs/commodity/copper/24000197.pdf>.

4.3 FIRM CHARACTERISTICS

The seven copper smelters operating in the U.S. are owned by five companies: four domestic companies and one Australian company. Table 4-3 shows sales and employment data for the smelters' parent companies.[25]

TABLE 4-3. CHARACTERISTICS OF COMPANIES OWNING PRIMARY COPPER SMELTERS

Smelter	Parent Company	Sales	Employment
ASARCO, Inc.	ASARCO, Inc.	2,696,694,000	12,000
BHP, Inc.	BHP Copper, Inc.	504,500,000	5,000
Cyprus Miami	Cyprus Climax Metals	444,000,000	4,400
Phelps Dodge, Inc.	Phelps Dodge Corporation	3,786,600,000	15,343

Source: Dun and Bradstreet. Dun's Market Identifiers. On-line database, accessed through EPA's National Computation Center computer, FINDS system. October 1997.

All of the copper smelting operations in the U.S. are owned by large mining companies. According to the Small Business Administration, small primary metals companies (SIC 3331) are defined as those having 1,000 or fewer employees. Even the smallest of the smelter parent companies has four times that number of employees. Thus, the NESHAP is not projected to have direct impacts on any small companies.

4.4 HISTORICAL MARKET DATA

As noted above, the U.S. is the second largest producing nation for mined copper and is the largest producer and consumer of refined copper. Table 4-4 provides historical data on smelter production, consumption of refined copper, prices, imports, and exports.[26,27,28]

TABLE 4-4. HISTORICAL DATA ON THE MARKET FOR REFINED COPPER

Year	Smelter Production (10^3 tons)	Refined Copper Consumption (10^3 tons)	Price of Refined Copper (cents per pound)	Imports of Refined Copper (10^3 tons)	Exports of Refined Copper (10^3 tons)
1989	1,232	2,386	130.95	330	143
1990	1,276	2,386	123.16	288	232
1991	1,232	2,225	109.33	318	289
1992	1,298	2,398	107.42	318	195
1993	1,397	2,596	91.56	377	239
1994	1,441	2,948	111.05	517	173
1995	1,364	2,783	138.33	472	239
1996	1,419[a]	2,893	109.44	682	214

[a] Note: The 1996 smelter production listed here includes smelter production at the Kennecott smelter, which is omitted from the production estimates in this report because it is an area source.

Sources: Edelstein, Daniel. Copper. Minerals Yearbook 1993. Reston, VA, U.S. Geological Survey. Table 1, Salient Copper Statistics. April 1995.

Edelstein, Daniel. Mineral Industry Surveys, Copper, Annual Review 1994. Washington, DC, U.S. Department of the Interior, U.S. Geological Survey. November 1995.

Edelstein, Daniel. Copper. Minerals Yearbook 1995. Reston, VA, U.S. Geological Survey. <http://minerals.er.usgs.gov/minerals/pubs/commodity/copper/240495>. 1997. p.3 and Table 1, Salient Copper Statistics.

SECTION 5
THE REGULATION

The Agency estimated the costs of complying with the proposed air emission standard by identifying the capital equipment each smelter would be expected to purchase and install to comply with the regulation. Changes in operating, maintenance, monitoring, and recordkeeping operations that would be expected to be implemented to comply with the regulation were also considered, and their costs estimated.

The capital equipment estimated to be purchased and installed includes baghouses and leak detector systems for existing baghouses. Some facilities are not expected to incur any costs of compliance, while others are expected to incur capital costs exceeding $6,000,000.

Table 5-1 shows the estimated costs of complying with the regulation.[29] Capital costs are lump-sum costs that are incurred only once, when the capital equipment is purchased and installed. To estimate the annual burden of these costs on the smelters, the lump-sum capital costs are converted to a stream of annualized costs, by annualizing them over 20 years using a 7 percent discount rate. Annual costs, on the other hand, are continuing costs that are incurred each year. The total annualized costs of the regulation are the sum of the

TABLE 5-1. ESTIMATED COSTS OF COMPLYING WITH THE PRIMARY COPPER SMELTING NESHAP

Smelter	Location	Capital Costs ($1996)	Annual Costs ($1996)	Total Annualized Costs ($1996)
ASARCO	El Paso, TX	24,000	97,100	99,365
ASARCO	Hayden, NM	12,000	95,300	96,433
BHP	San Manuel, AZ	0	93,500	93,500
Cyprus Miami	Globe, AZ	12,000	95,300	96,433
Phelps Dodge	Hidalgo, NM	24,000	97,100	99,365
Phelps Dodge	Hurley, NM	6,136,000	1,135,900	1,715,095
Total		6,208,000		2,200,191

Source: Memorandum, from Crumpler, Eugene, Environmental Engineer, U.S. Environmental Protection Agency to Linda Chappell, Economist, U.S. Environmental Protection Agency. September 19, 1997. Information for Development of Costs of Proposed Primary Copper Smelter Standard.

annualized stream of capital costs plus the annual operating and maintenance, monitoring, and recordkeeping costs.

SECTION 6

ECONOMIC IMPACTS OF THE REGULATION

The Agency has estimated the economic impacts of the primary copper smelting NESHAP by comparing the estimated costs of complying with the NESHAP with the smelters' baseline sales of refined copper. Table 6-1 shows the ratio of total annualized compliance costs (TAC) to facility sales.

TABLE 6-1. ESTIMATED IMPACTS OF PRIMARY COPPER SMELTING NESHAP

Smelter	Location	TAC/Sales (percent)
ASARCO	El Paso, TX	0.036
ASARCO	Hayden, AZ	0.023
BHP	San Manuel, AZ	0.012
Cyprus Miami	Globe, AZ	0.023
Phelps Dodge	Hidalgo, NM	0.020
Phelps Dodge	Hurley, NM	0.442

[a] TAC is computed as described in Section 5. It is compared to the sales estimates developed in Section 4.

As shown above, the estimated economic impacts of the primary copper smelting NESHAP on smelting facilities, as measured by the ratio of TAC to sales, is quite low. One U.S. smelter, Kennecott, is expected to incur no compliance costs because it is an area source of air emissions. The NESHAP is expected to have no direct economic impact on this facility.

The maximum TAC/sales ratio incurred by any smelter is less than 0.5 percent. The maximum TAC per refined copper sales ratio of 0.0442 percent is incurred by the only facility that is expected to need to install a baghouse, in addition to leak detector systems. For the other four smelting facilities, total annualized compliance costs are estimated to be less than 0.1 percent of refined copper sales. Based on the facility-level TAC/sales estimates above, impacts of the NESHAP on the companies owning smelting facilities are anticipated to be negligible. On average, TAC/sales ratios of 0.08 percent are expected for the facilities affected by the NESHAP. When compliance costs of the regulation are compared to total company sales, this ratio declines to 0.003 percent on average. With facilities expected to incur such small impacts, no appreciable impact on international trade in refined copper, or on other secondary markets, is anticipated.

REFERENCES

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