SULFUR

(Data in thousand metric tons, sulfur content, unless otherwise specified)

Domestic Production and Use: In 2023, recovered elemental sulfur and byproduct sulfuric acid were produced at 86 operations in 26 States. Total shipments were valued at about $860 million. Elemental sulfur production was estimated to be 8.0 million tons; Louisiana and Texas accounted for about 52% of domestic production. Elemental sulfur was recovered, in descending order of tonnage, at petroleum refineries, natural-gas-processing plants, and coking plants by 31 companies at 81 plants in 25 States. Byproduct sulfuric acid, representing about 7% of production of sulfur in all forms, was recovered at five nonferrous-metal smelters in four States by four companies. Domestic elemental sulfur accounted for 66% of domestic consumption, and byproduct sulfuric acid accounted for about 6%. The remaining 28% of sulfur consumed was provided by imported sulfur and sulfuric acid. About 90% of sulfur consumed was in the form of sulfuric acid.

Salient Statistics—United States:	2019	2020	2021	2022	2023[e]
Production:					
Recovered elemental	8,110	7,310	7,460	8,000	8,000
Other forms	596	581	600	636	600
Total (rounded)	8,710	7,890	8,060	8,640	8,600
Shipments, all forms	8,700	7,900	8,050	8,620	8,600
Imports for consumption:					
Recovered elemental[e]	1,850	2,230	2,370	1,670	1,500
Sulfuric acid	971	1,190	1,070	1,060	1,100
Exports:					
Recovered elemental	2,200	1,330	1,900	1,740	1,800
Sulfuric acid	72	64	129	123	60
Consumption, apparent, all forms[1]	9,250	9,940	9,460	9,480	9,400
Price, average unit value, free on board, mine and (or) plant, dollars per metric ton of elemental sulfur	51.10	24.60	90.90	178.5	100
Stocks, producer, yearend	124	109	113	126	100
Employment, mine and (or) plant, number	2,400	2,400	2,400	2,400	2,400
Net import reliance[2] as a percentage of apparent consumption	6	21	15	9	8

Recycling: Typically, between 2.5 million and 5 million tons of spent sulfuric acid is reclaimed from petroleum refining and chemical processes during any given year.

Import Sources (2019–22): Elemental: Canada, 77%; Russia, 10%; Kazakhstan, 9%; and other, 4%. Sulfuric acid: Canada, 57%; Mexico, 20%; Spain, 7%; and other, 16%. Total sulfur imports: Canada, 70%; Mexico, 7%; Russia, 7%; Kazakhstan, 6%; and other, 10%.

Tariff: Item	Number	Normal Trade Relations 12–31–23
Sulfur, crude or unrefined	2503.00.0010	Free.
Sulfur, all kinds, other	2503.00.0090	Free.
Sulfur, sublimed or precipitated	2802.00.0000	Free.
Sulfuric acid	2807.00.0000	Free.

Depletion Allowance: 22% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Total U.S. sulfur production in 2023 was estimated to be unchanged from that in 2022, and shipments to be essentially unchanged from those in 2022. Domestic production of elemental sulfur from petroleum refineries and recovery from natural gas operations was estimated to have remained the same. Domestically, refinery sulfur production is expected to remain about the same as refining utilization remains high. Domestic byproduct sulfuric acid is expected to remain relatively constant, unless one or more of the remaining nonferrous-metal smelters close.

Prepared by **Lori E. Apodaca [(703) 648–7724, lapodaca@usgs.gov]**

SULFUR

Domestic phosphate rock consumption in 2023 was estimated to have increased from that in 2022, which resulted in the higher consumption of sulfur to process the phosphate rock into phosphate fertilizers. New sulfur demand associated with phosphate fertilizer projects is expected mostly in Africa and west Asia.

World sulfur production was unchanged compared with that in 2022. Starting in 2023, sulfur production from the Middle East owing to upgrades and new refining projects will begin to increase sulfur availability. Also, an increase in nickel production from high-pressure acid leach projects to produce battery materials will begin to increase sulfur demand.

Contract sulfur prices in Tampa, FL, began 2023 at around $90 per long ton. The sulfur price increased to $130 per long ton in mid-January, and then decreased to $55 per long ton in mid-July. Fourth quarter 2023 prices were $102 per long ton. In the past few years, sulfur prices have been variable, a result of the volatility in the demand for sulfur.

World Production and Reserves:

	Production, all forms		Reserves[3]
	2022	2023[e]	
United States	8,640	8,600	Reserves of sulfur in crude oil, natural gas, and sulfide ores are large. Because most sulfur production is a result of the processing of fossil fuels, supplies are expected to be adequate for the foreseeable future. Because petroleum and sulfide ores can be processed long distances from where they are produced, sulfur production may not be in the country to which the reserves were attributed. For instance, sulfur from Saudi Arabian oil may be recovered at refineries in the United States.
Australia	900	900	
Canada	4,900	4,900	
Chile	1,400	1,400	
China[4]	18,800	19,000	
Finland	640	640	
Germany	610	610	
India	3,540	3,500	
Iran	1,600	1,600	
Japan	3,140	3,100	
Kazakhstan	4,300	4,300	
Korea, Republic of	3,080	3,100	
Kuwait	600	600	
Poland	1,050	1,100	
Qatar	2,100	2,100	
Russia	7,530	7,000	
Saudi Arabia	7,500	8,000	
Turkmenistan	860	860	
United Arab Emirates	5,400	5,400	
Other countries	5,600	5,600	
World total (rounded)	82,000	82,000	

World Resources:[3] Resources of elemental sulfur in evaporite and volcanic deposits, and sulfur associated with natural gas, petroleum, tar sands, and metal sulfides, total about 5 billion tons. The sulfur in gypsum and anhydrite is almost limitless, and 600 billion tons of sulfur is contained in coal, oil shale, and shale that is rich in organic matter. Production from these sources would require development of low-cost methods of extraction. The domestic sulfur resource is about one-fifth of the world total.

Substitutes: Substitutes for sulfur at present or anticipated price levels are not satisfactory; some acids, in certain applications, may be substituted for sulfuric acid, but usually at a higher cost.

[e]Estimated.

[1]Defined as shipments + imports – exports ± adjustments for industry stock changes.

[2]Defined as imports – exports ± adjustments for industry stock changes.

[3]See Appendix C for resource and reserve definitions and information concerning data sources.

[4]Sulfur production in China includes byproduct elemental sulfur recovered from natural gas and petroleum, the estimated sulfur content of byproduct sulfuric acid from metallurgy, and the sulfur content of sulfuric acid from pyrite.