SILICON

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

Domestic Production and Use: Ferrosilicon and silicon metal were produced at five facilities in 2024, all east of the Mississippi River. An additional silicon metal facility was idled at the end of 2023 owing to poor market conditions. Most ferrosilicon was consumed in the ferrous foundry and steel industries, predominantly in the Eastern United States, and was sourced primarily from domestic quartzite (silica). The main consumers of silicon metal were producers of aluminum alloys and the chemical industry, in particular for the manufacture of silicones. Silicon metal may be further processed into ultra-high-purity semiconductor- or solar-grades, commonly referred to as polysilicon. Four companies produced polysilicon in the United States.

Salient Statistics—United States:	2020	2021	2022	2023	2024[e]
Production, ferrosilicon[1] and silicon metal[2]	W	W	W	W	W
Imports for consumption:					
Ferrosilicon, all grades	140	125	175	153	150
Silicon metal	97	97	116	79	110
Exports:					
Ferrosilicon, all grades	4	7	9	5	4
Silicon metal	32	53	47	42	40
Consumption, apparent,[3] ferrosilicon[1] and silicon metal[2]	W	W	W	W	W
Price, average, cents per pound of silicon:					
Ferrosilicon, 50% silicon[4]	103.38	137.94	NA	NA	NA
Ferrosilicon, 75% silicon[5]	87.40	192.28	312.10	142.23	130
Silicon metal[2, 5]	96.84	220.31	361.86	179.69	180
Stocks, producer, ferrosilicon[1] and silicon metal,[2] yearend	W	11	17	15	14
Net import reliance[6] as a percentage of apparent consumption:					
Ferrosilicon, all grades	>50	<50	>50	>50	>50
Silicon metal[2]	<50	<25	<50	<50	<50
Total	<50	<50	<50	<50	<50

Recycling: Insignificant.

Import Sources (2020–23): Ferrosilicon: Russia, 37%; Brazil, 14%; Canada, 13%; Malaysia, 9%; and other, 27%. Silicon metal: Brazil, 38%; Canada, 28%; Norway, 13%; Australia, 5%; and other, 16%. Total: Brazil, 24%; Russia, 23%; Canada, 19%; Malaysia, 7%; and other, 27%.

Tariff: Item	Number	Normal Trade Relations 12–31–24
Silicon:		
More than or equal to 99.99% silicon	2804.61.0000	Free.
More than or equal to 99.00% but less than 99.99% silicon	2804.69.1000	5.3% ad valorem.
Other	2804.69.5000	5.5% ad valorem.
Ferrosilicon:		
More than 55% but less than or equal to 80% silicon:		
More than 3% calcium	7202.21.1000	1.1% ad valorem.
Other	7202.21.5000	1.5% ad valorem.
More than 80% but less than or equal to 90% silicon	7202.21.7500	1.9% ad valorem.
More than 90% silicon	7202.21.9000	5.8% ad valorem.
Other:		
More than 2% magnesium	7202.29.0010	Free.
Other	7202.29.0050	Free.

Depletion Allowance: Quartzite, 14% (domestic and foreign); gravel, 5% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Combined domestic ferrosilicon and silicon metal production in 2024 was withheld to avoid disclosing proprietary information but was estimated to be less than that in 2023. The January through September 2024 average U.S. spot price for 75%-grade ferrosilicon was almost 9% less than the annual average price in 2023, and the average U.S. spot price of silicon metal was 180.00 cents per pound compared with the annual average of 179.69 cents per pound in 2023.

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Since the CHIPS and Science Act was signed into law in 2022, the U.S. Department of Commerce announced as of October 2024 preliminary agreements with 20 companies for 32 semiconductor manufacturing projects in 20 States. In total, these projects have received almost $34 billion of the available $39 billion in direct funding and almost $29 billion in loans. The Department of Commerce planned to allocate the remaining funds to CHIPS and Science Act grantees by the end of 2024.

As part of a new integrated silicon-based solar supply chain facility in Georgia, production of silicon solar modules began in April 2024. The facility was expected to be fully operational in 2025 and will manufacture silicon ingots, wafers, cells, and modules. In Washington, a solar-grade polysilicon production facility was restarted after being idle since 2019. Shipment of the polysilicon was pending following third party quality testing. In Montana, a facility stopped production of its electronic-grade polysilicon to focus on silicon gas production.

Excluding the United States, ferrosilicon accounted for more than 50% of world silicon production on a silicon-content basis in 2024. China accounted almost 80% of total global estimated production of silicon materials in 2024. Global production of silicon materials, on a silicon-content basis, was estimated to have increased slightly from that in 2023. In 2024, Canada's Minister of Energy and Natural Resources added silicon metal to its critical minerals list and silicon metal was included as a strategic raw material in the European Union's Critical Raw Materials Act owing to its importance in the manufacture of semiconductor chips, the electronics market, and solar power generation.

World Production:

	Ferrosilicon[e]		Silicon metal[e]	
	2023	2024	2023	2024
United States	W	W	W	W
Australia	—	—	39	40
Bhutan	82	80	—	—
Brazil	190	200	196	190
Canada	23	20	29	30
China	3,640	3,500	3,630	3,900
France	23	20	90	90
Germany	—	—	59	60
Iceland	73	70	24	20
India	59	60	—	—
Kazakhstan	127	130	7	7
Malaysia	91	130	—	—
Norway	176	180	123	120
Poland	33	30	—	—
Russia	473	470	54	50
South Africa	37	40	13	10
Spain	44	40	5	5
Other countries	119	130	11	78
World total (rounded)[7]	5,190	5,100	4,280	4,600

World Resources:[8] World and domestic resources for making silicon metal and alloys are abundant and, in most producing countries, adequate to supply world requirements for many decades. The source of the silicon is silica in various natural forms, such as quartzite.

Substitutes: Aluminum, silicon carbide, and silicomanganese can be substituted for ferrosilicon in some applications. Gallium arsenide and germanium are the principal substitutes for silicon in semiconductor and infrared applications.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

[1]Ferrosilicon grades include the two standard grades of ferrosilicon—50% silicon and 75% silicon—plus miscellaneous silicon alloys.

[2]Metallurgical-grade silicon metal.

[3]Defined as production + imports – exports ± adjustments for industry stock changes.

[4]Source: CRU Group, transaction prices based on weekly averages. Average spot prices for ferrosilicon, 50% grade, were discontinued in April 2022.

[5]Source: S&P Global Platts Metals Week, mean import prices based on monthly averages. Estimated 2024 price is the mean based on monthly average of January through September 2024.

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

[7]Excludes U.S. production.

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