

SILICON

(Data in thousand metric tons of silicon content unless otherwise noted)

Domestic Production and Use: Six companies produced silicon materials in 2020, all east of the Mississippi River. 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. The semiconductor and solar energy industries, which manufacture chips for computers and photovoltaic cells from high-purity silicon, respectively, also consumed silicon metal.

Salient Statistics—United States:	2016	2017	2018	2019	2020^e
Production, ferrosilicon ¹ and silicon metal ²	384	415	430	310	290
Imports for consumption:					
Ferrosilicon, all grades	155	147	140	127	120
Silicon metal	122	136	116	124	95
Exports:					
Ferrosilicon, all grades	7	11	12	8	4
Silicon metal	60	71	45	40	31
Consumption, apparent, ³ ferrosilicon ¹ and silicon metal ²	601	616	637	517	470
Price, average, cents per pound of silicon:					
Ferrosilicon, 50% Si ⁴	83	94	104	102	104
Ferrosilicon, 75% Si ⁵	71	87	108	89	88
Silicon metal ^{2, 5}	91	117	134	106	96
Stocks, producer, ferrosilicon ¹ and silicon metal, ² yearend	26	26	19	15	16
Net import reliance ⁶ as a percentage of apparent consumption:					
Ferrosilicon, all grades	>50	<50	<50	<50	<50
Silicon metal ²	<50	<50	<50	<50	<50
Total	36	33	32	40	38

Recycling: Insignificant.

Import Sources (2016–19): Ferrosilicon: Russia, 37%; Canada, 14%; Brazil, 11%; and other, 38%. Silicon metal: Brazil, 30%; Canada, 20%; Norway, 12%; and other, 38%. Total: Brazil, 20%; Russia, 20%; Canada, 16%; and other, 44%.

Tariff:	Item	Number	Normal Trade Relations 12–31–20
	Silicon, more than 99.99% Si	2804.61.0000	Free.
	Silicon, 99.00%–99.99% Si	2804.69.1000	5.3% ad val.
	Silicon, other	2804.69.5000	5.5% ad val.
	Ferrosilicon, 55%–80% Si:		
	More than 3% Ca	7202.21.1000	1.1% ad val.
	Other	7202.21.5000	1.5% ad val.
	Ferrosilicon, 80%–90% Si	7202.21.7500	1.9% ad val.
	Ferrosilicon, more than 90% Si	7202.21.9000	5.8% ad val.
	Ferrosilicon, other:		
	More than 2% Mg	7202.29.0010	Free.
	Other	7202.29.0050	Free.

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

Government Stockpile: None.

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Events, Trends, and Issues: Combined domestic ferrosilicon and silicon metal production in 2020, expressed in terms of contained silicon, decreased from that of 2019. One producer shut down its ferrosilicon production facility on July 1 owing to decreased demand and lower prices—in part because of the global COVID-19 pandemic, as well as competition from lower priced imported ferrosilicon. Domestic production during the first 8 months of 2020 was about 11% less, on a contained-weight basis, than that during the same period in 2019. By August 2020, average U.S. ferrosilicon spot market prices had increased slightly for 50%-grade ferrosilicon and decreased slightly for 75%-grade ferrosilicon compared with those in 2019; the average silicon metal spot market price had decreased by 10% compared with the annual average spot price in 2019.

Excluding the United States, ferrosilicon accounted for about 64% of world silicon production on a silicon-content basis in 2020. The leading countries for ferrosilicon production were, in descending order and on a contained-weight basis, China, Russia, and Norway. For silicon metal, the leading producers were China, Brazil, Norway, and France. China accounted for approximately 68% of total global estimated production of silicon materials in 2020. Global production of silicon materials, on a contained weight basis, was estimated to be about 5% less than that in 2019.

Steel production, the leading use of ferrosilicon, decreased across the globe in 2020 compared with production in 2019 owing to reduced demand attributed to the global COVID-19 pandemic.

World Production and Reserves:

	Production ⁷		Reserves ⁸
	2019	2020 ^e	
United States	310	290	The reserves in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Bhutan ⁹	90	85	
Brazil	340	340	
Canada	57	57	
China	5,700	5,400	
France	130	130	
Iceland	88	87	
India ⁹	60	55	
Malaysia ⁹	150	130	
Norway	375	330	
Russia	610	540	
South Africa	96	96	
Spain	66	66	
Ukraine ⁹	63	60	
Other countries	<u>278</u>	<u>290</u>	
World total (rounded)	8,410	8,000	

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.

^eEstimated. W Withheld to avoid disclosing company proprietary data.

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

²Metallurgical-grade silicon metal.

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

⁴Source: CRU Group, transaction prices based on weekly averages.

⁵Source: S&P Global Platts, mean import prices based on monthly averages.

⁶Defined as imports – exports + adjustments for industry stock changes.

⁷Production quantities are the silicon content of combined totals for ferrosilicon and silicon metal, except as noted.

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

⁹Silicon content of ferrosilicon only.