

SILICON

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

Domestic Production and Use: Estimated value of silicon alloys and metal produced in the United States in 2015 was \$1.14 billion. Four companies produced silicon materials in seven plants, all east of the Mississippi River. Ferrosilicon and metallurgical-grade silicon metal were produced in four and five plants, respectively. Two companies produced both products at two plants. 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 and aluminum alloys and the chemical industry. The semiconductor and solar energy industries, which manufacture chips for computers and photovoltaic cells from high-purity silicon, respectively, accounted for only a small percentage of silicon demand.

Salient Statistics—United States:	2011	2012	2013	2014	2015^e
Production:					
Silicon alloys and metal	326	383	365	373	410
Imports for consumption:					
Ferrosilicon, all grades ¹	156	173	159	186	153
Silicon metal	187	136	118	139	150
Exports:					
Ferrosilicon, all grades ¹	20	12	10	9	10
Silicon metal	79	75	38	45	39
Consumption, apparent:					
Ferrosilicon, all grades ¹	W	W	W	W	W
Silicon metal ²	W	W	W	W	W
Total	564	601	602	642	660
Price, ³ average, cents per pound Si:					
Ferrosilicon, 50% Si	111	100	103	108	104
Ferrosilicon, 75% Si	102	92	94	98	92
Silicon metal ²	158	127	122	140	136
Stocks, producer, yearend:					
Silicon alloys and metal	30	34	25	27	34
Net import reliance ⁴ as a percentage of apparent consumption:					
Ferrosilicon, all grades ¹	<50	<50	<50	<50	<50
Silicon metal ²	<50	<50	<50	<50	<50
Total	42	36	39	42	38

Recycling: Insignificant.

Import Sources (2011–14): Ferrosilicon: Russia, 42%; China, 26%; Canada, 11%; Venezuela, 10%; and other, 11%. Silicon metal: Brazil, 32%; South Africa, 24%; Canada, 14%; Australia, 11%; and other, 19%. Total: Russia, 23%; Brazil, 16%; China, 14%; Canada, 12%; and other, 35%.

Tariff: Item	Number	Normal Trade Relations 12–31–15
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).

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Government Stockpile: None.

Events, Trends, and Issues: Combined domestic ferrosilicon and silicon metal production in 2015, expressed in terms of contained silicon, was expected to increase from that of 2014. By August 2015, annual average U.S. ferrosilicon spot market prices had decreased by 4% and 6%, for 50%-grade and 75%-grade ferrosilicon, respectively, and the annual average silicon metal spot market price had decreased by 3% compared with the same period in 2014.

Despite a slight reduction in global steel demand in 2015, production of silicon materials was expected to remain about the same in 2015 as in 2014. Although U.S. domestic production was estimated to have increased in 2015, Brazil experienced its worst recession in 25 years, with foundry production decreasing by about 8% in the first half of 2015. In Ukraine, ferrosilicon production significantly decreased in 2015 owing to the idling of its main ferrosilicon producer in August 2014.

A new 36,000-metric-ton-per-year silicon metal processing facility in Burnsville, MS, began operations in September. It was the first new silicon metal production facility built in the United States during the past 40 years.

World Production and Reserves:

	Production ^{e, 5}		Reserves ⁶
	2014	2015	
United States	373	410	The reserves in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Bhutan ⁷	72	72	
Brazil	154	150	
Canada	52	52	
China	5,500	5,500	
France	130	130	
Iceland	75	75	
India ⁷	86	86	
Norway	332	330	
Russia	700	680	
South Africa	84	84	
Spain	81	81	
Ukraine ⁷	92	70	
Other countries	379	380	
World total (rounded)	8,110	8,100	

Excluding the United States, ferrosilicon accounts for about 64% of world silicon production on a silicon-content basis. The leading countries for ferrosilicon production were, in descending order and on a contained-weight basis, China, Russia, Norway, and the United States, and, for silicon metal, the leading producers were China, the United States, Norway, and France. China contributed approximately 68% to the global estimated production in 2015.

World Resources: 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.

³Based on U.S. dealer import price.

⁴Defined as imports – exports + adjustments for industry stock changes.

⁵Production quantities are combined totals of estimated silicon content for ferrosilicon and silicon metal, as applicable, except as noted.

⁶See [Appendix C](#) for resource/reserve definitions and information concerning data sources.

⁷Ferrosilicon only.