

SILICON

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

Domestic Production and Use: Estimated value of silicon metal and alloys (excluding semiconductor-grade silicon) produced in the United States in 2000 was about \$420 million. Ferrosilicon was produced by six companies in six plants, and silicon metal was produced by three companies in six plants. Two of the eight companies in the industry produced both products. Most of the ferrosilicon and silicon metal plants were east of the Mississippi River or in the Pacific Northwest. Most ferrosilicon was consumed in the ferrous foundry and steel industries, predominantly in the eastern one-half of the United States. The main consumers of silicon metal were producers of aluminum and aluminum alloys and the chemical industry. The semiconductor industry, which manufactures chips for computers from high-purity silicon, accounted for only a few percent of silicon demand.

Salient Statistics—United States:	1996	1997	1998	1999	2000^e
Production	412	430	429	423	374
Imports for consumption	227	256	241	286	378
Exports	44	50	47	61	41
Consumption, apparent	594	628	616	643	715
Price, ¹ average, cents per pound Si:					
Ferrosilicon, 50% Si	64.0	54.8	52.1	49.1	45
Ferrosilicon, 75% Si	62.2	48.0	43.1	40.2	36
Silicon metal	89.7	81.4	70.5	58.1	56
Stocks, producer, yearend	35	44	50	54	50
Net import reliance ² as a percent of apparent consumption	31	32	30	34	48

Recycling: Insignificant.

Import Sources (1996-99): Norway, 29%; South Africa, 13%; Russia, 11%; Canada, 10%; and other, 37%.

Tariff: Item	Number	Normal Trade Relations 12/31/00
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.
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.

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

Government Stockpile: None.

Events, Trends, and Issues: Domestic apparent consumption of silicon for 2000 is projected as about 15% greater than the average for 1996-99. Of the 2000 total, ferrosilicon is estimated to account for 57% and silicon metal 43%, or almost the same amount as for 1999. The annual growth rate for ferrosilicon demand is expected to fall in the range of 1% to 2%, in line with long-term trends in steel production. For 2000, trends through August suggested that domestic steel production could be more than 10% greater than that for 1999. The annual growth rate for silicon metal demand has been greater than that for ferrosilicon—about 3% for silicon demand by the aluminum industry and about 8% for silicon demand by the chemical industry. Global demand by the chemical industry, principally for silicones, appears to have been recovering from effects of the recent Asian economic crisis, so a return to a growth rate of 4% or greater for silicon overall may be possible.

The decline projected for domestic production in 2000, expressed in terms of contained silicon, is concentrated in ferrosilicon, especially the 75% grade. Between September 1999 and January 2000, two domestic plants producing silicon materials were shut down, at least partly because of low prices.

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Through the first one-half of 2000, prices in the U.S. market for 75% ferrosilicon and silicon metal generally trended upward and then turned downward. The price quotation for 50% ferrosilicon was unchanged until it was discontinued in mid-September by the traditional source. Prices as of the end of September differed from those at the beginning of the year only by about 1%, lower for 75% ferrosilicon and higher for silicon metal. Year-average prices lower than for 1999 were projected for all forms of silicon; the largest percentage decline was for 75% ferrosilicon. At the end of September, the range in dealer import price, in cents per pound of contained silicon, was 43 to 47 for 50% ferrosilicon, 33.5 to 36 for 75% ferrosilicon, and 52 to 54 for silicon metal.

U.S. foreign trade in silicon materials in 2000, projected on the basis of data for the first 6 months of the year, showed substantial percentage changes as compared with trade in 1999, with increases for imports and decreases for exports. On an overall basis, this applied to ferrosilicon and silicon metal, giving rise to a net import reliance that approached 50%. At least for ferrosilicon, particularly the 75% grade, this could be seen as an outgrowth of removal of antidumping and countervailing duties late in 1999, a Governmental action being challenged in the courts.

World Production, Reserves, and Reserve Base:

	Production ^e		Reserves and reserve base ³
	1999	2000	
United States	423	374	The reserves and reserve base in most major producing countries are ample in relation to demand. Quantitative estimates are not available.
Australia	29	29	
Brazil	205	215	
Canada	66	65	
China	910	870	
Egypt	29	26	
France	145	145	
Germany	20	25	
Iceland	49	59	
India	36	33	
Kazakhstan	78	91	
Macedonia	33	27	
Norway	404	410	
Poland	47	47	
Russia	430	460	
South Africa	95	97	
Spain	55	52	
Ukraine	158	195	
Venezuela	37	42	
Other countries	<u>103</u>	<u>115</u>	
World total (rounded)	3,400	3,400	

Production quantities given above are combined totals of estimated content for ferrosilicon and silicon metal, as applicable. For the world, ferrosilicon accounts for about four-fifths of the total. The leading countries for ferrosilicon production were China, Norway, Russia, Ukraine, and the United States, and for silicon metal Brazil, China, France, Norway, and the United States. China was by far the largest producer of ferrosilicon and may well have been the largest producer of silicon metal. China's production of silicon metal is not included in this tabulation because data are not available.

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: Various metals and alloys, such as aluminum and silicomanganese, can be substituted for ferrosilicon in some applications. Germanium and gallium arsenide are the principal substitutes for silicon in semiconductor and infrared applications.

^eEstimated.

¹Based on U.S. dealer import price.

²Defined as imports - exports + adjustments for Government and industry stock changes.

³See Appendix C for definitions.