

TUNGSTEN

(Data in metric tons of tungsten content unless otherwise noted)

Domestic Production and Use: A tungsten mine in California produced concentrates in 2012. Approximately eight companies in the United States processed tungsten concentrates, ammonium paratungstate, tungsten oxide, and (or) scrap to make tungsten powder, tungsten carbide powder, and (or) tungsten chemicals. More than one-half of the tungsten consumed in the United States was used in cemented carbide parts for cutting and wear-resistant materials, primarily in the construction, metalworking, mining, and oil- and gas-drilling industries. The remaining tungsten was consumed to make tungsten heavy alloys for applications requiring high density; electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications; steels, superalloys, and wear-resistant alloys; and chemicals for various applications. The estimated value of apparent consumption in 2012 was approximately \$1 billion.

| Salient Statistics—United States: | 2008 | 2009 | 2010 | 2011 | 2012^e |
|---|-------------|-------------|------------------|-------------|-------------------------|
| Production: | | | | | |
| Mine | NA | NA | NA | NA | NA |
| Secondary | 5,510 | 3,690 | 5,680 | 11,000 | 9,500 |
| Imports for consumption: | | | | | |
| Concentrate | 3,990 | 3,590 | 2,740 | 3,640 | 3,600 |
| Other forms | 9,060 | 6,410 | 9,690 | 9,600 | 8,400 |
| Exports: | | | | | |
| Concentrate | 496 | 38 | 276 | 169 | 130 |
| Other forms | 5,480 | 2,730 | 4,350 | 6,960 | 6,800 |
| Government stockpile shipments: | | | | | |
| Concentrate | 1,470 | 688 | 2,060 | 1,180 | 1,700 |
| Other forms | 51 | 12 | (¹) | 46 | 4 |
| Consumption: | | | | | |
| Reported, concentrate | W | W | 4,820 | W | W |
| Apparent, ^{2,3} all forms | 13,800 | 11,600 | 15,500 | 18,100 | 16,400 |
| Price, concentrate, dollars per mtu WO ₃ , ⁴ average: | | | | | |
| U.S. spot market, Platts Metals Week | 184 | 151 | 183 | 248 | 360 |
| European market, Metal Bulletin | 164 | 150 | 150 | 150 | 150 |
| Stocks, industry, yearend: | | | | | |
| Concentrate | W | W | W | W | W |
| Other forms | 2,240 | 2,210 | 2,530 | W | W |
| Net import reliance ⁵ as a percentage of apparent consumption | 60 | 68 | 63 | 40 | 42 |

Recycling: In 2012, the tungsten contained in scrap consumed by processors and end users represented approximately 52% of apparent consumption of tungsten in all forms.

Import Sources (2008–11): Tungsten contained in ores and concentrates, intermediate and primary products, wrought and unwrought tungsten, and waste and scrap: China, 45%; Bolivia, 8%; Canada, 6%; Germany, 6%; and other, 35%.

| Tariff: Item | Number | Normal Trade Relations⁶ 12–31–12 |
|---------------------|---------------|--|
| Ores | 2611.00.3000 | Free. |
| Concentrates | 2611.00.6000 | 37.5¢/kg tungsten content. |
| Tungsten oxides | 2825.90.3000 | 5.5% ad val. |
| Ammonium tungstates | 2841.80.0010 | 5.5% ad val. |
| Tungsten carbides | 2849.90.3000 | 5.5% ad val. |
| Ferrotungsten | 7202.80.0000 | 5.6% ad val. |
| Tungsten powders | 8101.10.0000 | 7.0% ad val. |

Depletion Allowance: 22% (Domestic), 14% (Foreign).

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Government Stockpile:

| Material | Stockpile Status—9–30–12 ⁷ | | | |
|-----------------------|---------------------------------------|-------------------------|-----------------------|-------------------|
| | Uncommitted inventory | Authorized for disposal | Disposal plan FY 2012 | Disposals FY 2012 |
| Metal powder | 121 | 121 | 136 | 39 |
| Ores and concentrates | 14,200 | 14,200 | 3,630 | 1,610 |

Events, Trends, and Issues: World tungsten supply was dominated by Chinese production and exports. China was also the world's leading tungsten consumer. China's Government has regulated its tungsten industry by limiting the number of exploration, mining, and export licenses; limiting or forbidding foreign investment; imposing constraints on mining and processing; establishing quotas on production and exports; adjusting export quotas to favor value-added downstream materials and products; and imposing export taxes on tungsten materials. To conserve its resources and meet increasing domestic demand, the Chinese Government planned the following: to expand exploration and increase ore reserves in approved mines, to continue to use quotas to control tungsten mine production, to improve its tungsten-processing technology and increase tungsten recovery from tailings and low-grade and mixed scheelite-wolframite ores, to limit the export of upstream tungsten materials, and to increase the development and sales of value-added downstream tungsten products.

In the next few years, mine production from outside China is expected to increase. Numerous companies worked towards developing tungsten deposits or restarting tungsten production from inactive mines in Asia, Australia, Europe, and North America.

Scrap was an important source of raw material for the tungsten industry. In 2011 and 2012, U.S. net import reliance for tungsten was lower than that of prior years owing to an increase in scrap consumption (secondary production).

World Mine Production and Reserves: Reserves for "Other countries" were revised upward based on company and Government data.

| | Mine production | | Reserves ⁸ |
|-----------------------|---------------------|---------------------|-----------------------|
| | 2011 | 2012 ^e | |
| United States | NA | NA | 140,000 |
| Austria | 1,100 | 1,100 | 10,000 |
| Bolivia | 1,100 | 1,100 | 53,000 |
| Canada | 1,970 | 2,000 | 120,000 |
| China | 61,800 | 62,000 | 1,900,000 |
| Portugal | 820 | 820 | 4,200 |
| Russia | 3,500 | 3,500 | 250,000 |
| Other countries | <u>2,700</u> | <u>3,000</u> | <u>760,000</u> |
| World total (rounded) | ³ 73,100 | ³ 73,000 | 3,200,000 |

World Resources: World tungsten resources are geographically widespread. China ranks first in the world in terms of tungsten resources and reserves and has some of the largest deposits. Canada, Kazakhstan, Russia, and the United States also have significant tungsten resources.

Substitutes: Potential substitutes for cemented tungsten carbides include cemented carbides based on molybdenum carbide and titanium carbide, ceramics, ceramic-metallic composites (cermets), and tool steels. Potential substitutes for other applications are as follows: molybdenum for certain tungsten mill products; molybdenum steels for tungsten steels; lighting based on carbon nanotube filaments, induction technology, and light-emitting diodes for lighting based on tungsten electrodes or filaments; depleted uranium or lead for tungsten or tungsten alloys in applications requiring high-density or the ability to shield radiation; and depleted uranium alloys or hardened steel for cemented tungsten carbides or tungsten alloys in armor-piercing projectiles. In some applications, substitution would result in increased cost or a loss in product performance.

^eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

¹Less than ½ unit.

²The sum of U.S. net import reliance and secondary production.

³Does not include U.S. mine production.

⁴A metric ton unit (mtu) of tungsten trioxide (WO₃) contains 7.93 kilograms of tungsten.

⁵Defined as imports – exports + adjustments for Government and industry stock changes.

⁶No tariff for Canada. Tariffs for other countries for some items may be eliminated under special trade agreements.

⁷See Appendix B for definitions.

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