

TUNGSTEN

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

Domestic Production and Use: There has been no known domestic commercial production of tungsten concentrates since 2015. Approximately six companies in the United States used chemical processes to convert tungsten concentrates, ammonium paratungstate (APT), tungsten oxide, and (or) scrap to tungsten metal powder, tungsten carbide powder, and (or) tungsten chemicals. Nearly 60% of the tungsten used in the United States was used in cemented carbide parts for cutting and wear-resistant applications, primarily in the construction, metalworking, mining, and oil and gas drilling industries. The remaining tungsten was used to make various alloys and specialty steels; electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications; and chemicals for various applications. The estimated value of apparent consumption in 2019 was approximately \$700 million.

| Salient Statistics—United States: | 2015 | 2016 | 2017 | 2018 | 2019^e |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Production: | | | | | |
| Mine | NA | — | — | — | — |
| Secondary | W | W | W | W | W |
| Imports for consumption: | | | | | |
| Concentrate | 3,970 | 3,580 | 3,920 | 4,050 | 2,900 |
| Other forms | 6,270 | 6,300 | 9,780 | 10,400 | 10,900 |
| Exports: | | | | | |
| Concentrate | 398 | 183 | 532 | 284 | 720 |
| Other forms | 3,360 | 3,200 | 3,010 | 3,210 | 2,900 |
| Shipments from Government stockpile: | | | | | |
| Concentrate | — | — | 1,460 | 1,180 | 750 |
| Other forms | — | — | — | — | — |
| Consumption: | | | | | |
| Reported, concentrate | W | W | W | W | W |
| Apparent, all forms ¹ | W | W | W | W | W |
| Price, concentrate, dollars per mtu WO ₃ , ² average, U.S. spot market, Platts Metals Week | 302 | 148 | 245 | 326 | 270 |
| Stocks, industry, yearend, concentrate and other forms | W | W | W | W | W |
| Net import reliance ³ as a percentage of apparent consumption | >25 | >25 | >50 | >50 | >50 |

Recycling: The estimated quantity of secondary tungsten produced and the amount consumed from secondary sources by processors and end users in 2019 were withheld to avoid disclosing company proprietary data.

Import Sources (2015–18): Tungsten contained in ores and concentrates, intermediate and primary products, wrought and unwrought tungsten, and waste and scrap: China, 31%; Bolivia, 10%; Germany, 9%; Spain, 6%; and other, 44%.

| Tariff: Item | Number | Normal Trade Relations 12–31–19 |
|--------------------------|---------------|--|
| 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. |
| Tungsten waste and scrap | 8101.97.0000 | 2.8% ad val. |

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

Government Stockpile:⁴

| | | FY 2019 | | FY 2020 | |
|--|------------------------------------|-----------------------------------|--------------------------------|-----------------------------------|--------------------------------|
| Material | Inventory As of 9–30–19 | Potential Acquisitions | Potential Disposals | Potential Acquisitions | Potential Disposals |
| Metal powder | 125 | — | 125 | — | 125 |
| Ores and concentrates | 8,370 | — | 1,360 | — | 1,360 |
| Tungsten alloys, gross weight ⁵ | 6 | 5 | — | 5 | — |

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Events, Trends, and Issues: World tungsten supply was dominated by production in China and exports from China. China's Government regulated its tungsten industry by limiting the number of mining and export licenses, imposing quotas on concentrate production, and placing constraints on mining and processing. Production of tungsten concentrate outside China in 2019 was expected to be less than that of 2018, owing in part to the closure of the sole tungsten mine in the United Kingdom after the owner entered voluntary administration in late 2018. Scrap continued to be an important source of raw material for the tungsten industry worldwide.

China was the world's leading tungsten consumer. Analysts forecast global tungsten demand in 2019 to be less than that in 2018, as a result of destocking by consumers and reduced consumption owing to reported slowing global economic growth. In September, APT stocks equivalent to 3 months of production in China were sold from the Fanya Metal Exchange to a leading Chinese tungsten mining and processing company. This relieved some of the uncertainty that had been hanging over the global tungsten market since the exchange's collapse in 2015. During most of 2019, Chinese and European prices of tungsten concentrate and downstream tungsten materials trended downward; prices increased following the Fanya sale.

World Mine Production and Reserves: Reserves for the United Kingdom were revised based on a company report. Reserves for North Korea are based on a report from an independent research organization funded by the Government of the Republic of Korea.

| | Mine production | | Reserves ⁶ |
|-----------------------|-----------------|-------------------|-----------------------|
| | 2018 | 2019 ^e | |
| United States | — | — | NA |
| Austria | 936 | 940 | 10,000 |
| Bolivia | 1,370 | 1,200 | NA |
| China | 65,000 | 70,000 | 1,900,000 |
| Korea, North | 1,410 | 1,100 | 29,000 |
| Mongolia | 1,940 | 1,900 | NA |
| Portugal | 715 | 700 | 3,100 |
| Russia | 1,500 | 1,500 | 240,000 |
| Rwanda | 920 | 1,100 | NA |
| Spain | 750 | 500 | 54,000 |
| United Kingdom | 900 | — | 44,000 |
| Vietnam | 4,800 | 4,800 | 95,000 |
| Other countries | 900 | 900 | 820,000 |
| World total (rounded) | 81,100 | 85,000 | 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, niobium carbide, or titanium carbide; ceramics; ceramic-metallic composites (cermets); and tool steels. Most of these options reduce, rather than replace, the amount of tungsten used. Potential substitutes for other applications are as follows: molybdenum for certain tungsten mill products; molybdenum steels for tungsten steels, although most molybdenum steels still contain tungsten; 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. — Zero.

¹Defined as mine production + secondary production + imports – exports + adjustments for Government and industry stock changes.

²A metric ton unit (mtu) of tungsten trioxide (WO₃) contains 7.93 kilograms of tungsten.

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

⁴See Appendix B for definitions.

⁵Inventory includes tungsten alloys and tungsten-rhenium metal; potential acquisitions are tungsten-rhenium metal only.

⁶See Appendix C for resource and reserve definitions and information concerning data sources.