



2013 Minerals Yearbook

TUNGSTEN [ADVANCE RELEASE]

TUNGSTEN

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In 2013, world production of tungsten concentrates increased for the fourth consecutive year to a record high of 81,400 metric tons (t) (table 1). The increase was primarily because of increased production from China, which accounted for 84% of the total (table 15). Scrap recycling continued to be an important source of raw material to the tungsten industry. World tungsten supply exceeded world consumption and resulted in a significant accumulation of tungsten stocks in China. The 2013 annual average price of tungsten concentrate in China was higher than that of 2012 in spite of trending downward during the second half of the year. Annual average prices of most tungsten materials in the United States and Europe were equal to or lower than those of 2012.

Domestically, one tungsten mine produced and shipped ore concentrates. Most of the U.S. supply of tungsten raw materials comprised imports, scrap, and sales from the National Defense Stockpile (NDS). China continued to be the leading supplier of downstream tungsten materials and products imported by the United States. U.S. apparent consumption decreased slightly in 2013 compared with that of 2012, and was 19% lower than the record high of 18,100 t in 2011.

Tungsten is a whitish-gray metal with the highest melting point of all metals and one of the highest densities. When combined with carbon to make tungsten carbide, it is almost as hard as diamond. These and other properties make it useful in a wide variety of important commercial, industrial, and military applications. The leading use for tungsten is as tungsten carbide in cemented carbides, which are wear-resistant materials used by the construction, metalworking, mining, and oil and gas drilling industries. Pure or doped tungsten metal is used for contacts, electrodes, and wires in electrical, electronic, heating, lighting, and welding applications. Tungsten is also used to make alloys and composites to substitute for lead in ammunition and other products; heavy-metal alloys for armaments, heat sinks, radiation shielding, and weights and counterweights; superalloys for turbine engine parts; tool steels; and wear-resistant alloy parts and coatings. Tungsten chemicals are used to make catalysts, corrosion-resistant coatings, dyes and pigments, fire-resistant compounds, lubricants, phosphors, and semiconductors.

Most data in this report have been rounded to three significant digits. Totals and percentages were calculated from unrounded numbers. Unless otherwise specified, all statistics in this report are in metric tons of contained tungsten. Most tungsten prices and many tungsten statistics from other sources are quoted in units of tungsten trioxide (WO_3). The short ton unit, which is used in the United States, is 1% of a short ton (20 pounds), and WO_3 is 79.3% tungsten by weight. A short ton unit of WO_3 , therefore, equals 20 pounds of WO_3 and contains 7.19 kilograms (kg) (15.86 pounds) of tungsten. The metric ton unit, which

is used in most other countries, is 1% of a metric ton (10 kg). A metric ton unit of WO_3 , therefore, equals 10 kg of WO_3 and contains 7.93 kg (17.48 pounds) of tungsten.

Legislation and Government Programs

During fiscal year 2013 (October 1, 2012, through September 30, 2013), Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense, sold 2,240 t of contained tungsten. All of the tungsten sold was shipped by the end of the fiscal year. During the calendar year, DLA Strategic Materials sold 2,080 t of contained tungsten. The quantities of uncommitted tungsten materials remaining in the stockpile at the end of the calendar year are listed in tables 1 and 2. DLA Strategic Materials reported the following goals for tungsten materials—tungsten metal powder, none; tungsten ores and concentrates, 5,120 t of contained tungsten. Goals are the amounts of materials to be maintained in the NDS and were based on a 2011 Biennial Report on Stockpile Requirements (U.S. Department of Defense, 2014, p. 4, 8).

The Annual Materials Plan (AMP) for fiscal year 2013, which represented the maximum quantities of tungsten materials that could be sold, is listed in table 2. The quantities of tungsten available for sale during fiscal year 2014 (October 1, 2013, through September 30, 2014) were increased to 3,580 t of tungsten contained in ores and concentrates and 90 t of tungsten metal powder (Defense Logistics Agency Strategic Materials, 2013).

In 2012, the Governments of the United States, the European Union, and Japan requested and held formal consultations with the People's Republic of China at the World Trade Organization (WTO) concerning China's export restraints on various forms of molybdenum, rare-earth metals, and tungsten. When the consultations did not resolve the matter, the WTO established a dispute settlement panel, which held hearings in February and June 2013. The dispute had not been resolved by yearend (Office of the United States Trade Representative, 2013, p. 44).

The U.S. Securities and Exchange Commission (SEC) was responsible for implementing Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which related to the use of minerals determined to be financing conflict in Congo (Kinshasa) or an adjoining country. Wolframite, one of two principal minerals mined for tungsten, was included in the list of conflict minerals. Section 1502 required companies for which conflict minerals or their derivatives were necessary to the functionality or manufacture of their products to disclose annually, beginning in 2014, whether any of those minerals originated in Congo (Kinshasa) or an adjoining country (U.S. Securities and Exchange Commission, 2012, p. 56274–56275). In response to the Act, a number of tungsten processors, with the support of the International Tungsten Industry Association

and the Refractory Metals Association, established the Tungsten Industry–Conflict Minerals Council (TI–CMC) to provide assurance that tungsten products originating from TI–CMC-compliant companies were conflict free. In 2013, the TI–CMC announced that it would be collaborating with the Conflict-Free Sourcing Initiative (CFSI) and that TI–CMC-compliant processing plants could undergo CFSI’s Conflict-Free Smelter Program audit (Conflict-Free Sourcing Initiative and Tungsten Industry–Conflict Minerals Council, 2013). Tungsten mine production from Congo (Kinshasa) and adjoining countries is typically less than 4% of world production (table 15).

Production

Domestic production statistics for tungsten are based on data collected by the U.S. Geological Survey (USGS) by means of two separate voluntary surveys. Statistics that result from these surveys are listed in tables 1 and 3. The annual “Tungsten Ore and Concentrate Survey” covered the production, purchase, disposition, and stocks of tungsten ores and concentrates. In 2013, Curtis Tungsten, Inc. (Upland, CA) produced and shipped scheelite concentrates from the Andrew Mine northeast of Los Angeles, CA.

In 2013, EMC Metals Corp. (Vancouver, British Columbia, Canada) sold its interest in Springer Mining Co. to Americas Bullion Royalty Corp. (Vancouver, British Columbia, Canada). The Springer Mine, in Pershing County, NV, comprised an underground scheelite mine, a beneficiation plant, and a processing circuit designed to produce either ammonium paratungstate (APT) or calcium tungstate (also known as synthetic scheelite). By yearend, Americas Bullion announced that it planned to sell the Springer assets to Silver Predator Corp. (Vancouver, British Columbia, Canada) (Americas Bullion Royalty Corp., 2013; EMC Metals Corp., 2013).

The USGS monthly “Tungsten Concentrate and Tungsten Products Survey” canvassed companies that produced tungsten carbide powder, tungsten chemicals, and (or) tungsten metal powder from APT, tungsten-bearing scrap, and tungsten concentrate. U.S. processors of tungsten materials operating in 2013 are listed in table 4.

In 2013, U.S. processors consumed more tungsten concentrates and APT and less scrap than in 2012. Domestic production of APT was higher than that of 2012. Total net production of tungsten metal powder and tungsten carbide powder was slightly lower than that of 2012 (table 3).

Kennametal Inc. (Latrobe, PA) made acquisitions to improve its tungsten sourcing capabilities. The company acquired the operating assets of Comercializadora Emura S.R.L. (La Paz, Bolivia), a tungsten ore processing and exporting company and Kennametal supplier. Kennametal also acquired the tungsten materials business of Allegheny Technologies Inc. (ATI), a producer of APT, tungsten powders, tungsten heavy alloy components, tungsten carbide materials, and cemented carbide products. Following the acquisition from ATI, Kennametal suspended an earlier plan to construct a new U.S. tungsten recycling facility (Kennametal Inc., 2013a, b).

Niagara Refining LLC (a joint venture of Sumitomo Electric Carbide Inc. and Buffalo Tungsten Inc.’s subsidiary New York Tungsten LLC) continued to build a plant in Depew, NY, to

convert tungsten concentrates to APT and tungsten oxides. The plant was permitted to produce a combined total of approximately 2,500 metric tons per year (t/yr) (2,750 short tons per year) of APT and oxide. Production was to begin in 2014 (New York State Department of Environmental Conservation, 2012, p. 1, 22; Bertola, 2014).

Consumption

U.S. apparent consumption of all tungsten materials, as calculated from net imports, secondary production, and changes in Government and industry stock levels, was 14,700 t in 2013, slightly lower than the 2012 apparent consumption of 15,000 t. Primary U.S. production was not available to include in the calculation. The decrease in apparent consumption in 2013 was mainly the result of lower scrap consumption and lower net imports compared with those of 2012.

Statistics on consumption of tungsten in end-use applications by U.S. metal consumers were developed from the voluntary “Consolidated Consumers Survey.” For this survey, nearly 60 tungsten consumers were canvassed on a monthly or annual basis. Reported consumption and stocks data in tables 1 and 5 include estimates to account for nonrespondents.

Total U.S. reported consumption of tungsten materials to make end-use products in 2013 was 6% lower than that of 2012. The only end-use category with 2013 consumption higher than that of 2012 was other alloys. Compared with consumption in 2012, U.S. end users consumed less of each tungsten material surveyed.

Weekly reports of the number of operating drilling rigs give an indication of the demand for tungsten carbide in the form of cemented carbide components used by industry to explore for or produce oil and natural gas. Although the number of rigs operating each week in the United States fluctuated during 2013, the trend was neither upward nor downward. The average number of weekly operating rigs in 2013 was 8% lower than the average number of operating rigs in 2012 (1,761 in 2013 as compared with 1,919 in 2012) (Baker Hughes Inc., undated).

In 2013, total consumption of tungsten scrap by U.S. processors and consumers was 7,700 t of contained tungsten, which was 6% less than the 8,190 t consumed in 2012.

Prices

The weekly U.S. spot price for tungsten ore concentrate reported by Platts Metals Daily remained unchanged since September 2011 at \$320 to \$330 per short ton unit (\$353 to \$364 per metric ton unit) (table 1).

The weekly U.S. APT price reported by Platts remained at \$395 to \$420 per short ton unit (\$435 to \$463 per metric ton unit) during January, then dropped to \$325 to \$330 per short ton unit (\$358 to \$364 per metric ton unit) for the remainder of the year. The annual average of Platts’ U.S. APT prices was 18% lower than that of 2012.

The ferrotungsten price reported by Platts trended upward in 2013. From January through mid-May, the price ranged from \$41 to \$43 per kilogram of contained tungsten. From late May through mid-December, it ranged from \$48 to \$51 per kilogram of contained tungsten. During the last 2 weeks of December,

the price increased to a range of \$58 to \$65 per kilogram of contained tungsten. The annual average price, at \$47.22 per kilogram of contained tungsten, was 6% less than the annual average of \$50.18 per kilogram of contained tungsten in 2012.

APT and tungsten metal were traded on China's Fanya Metal Exchange (Fanya Metal Exchange Co. Ltd., undated).

Foreign Trade

The tungsten content of U.S. exports was 7,730 t, a 15% increase from the 6,730 t exported in 2012 (tables 6–10). The tungsten content of U.S. imports was 12,200 t, 4% more than the 11,700 t imported in 2012 (tables 11–14). China, which continued to be the leading supplier of imported tungsten to the United States, provided 41% of all tungsten imports in 2013. The tungsten content of imports from China increased by 3% to 4,960 t in 2013, from 4,820 t in 2012. The distribution of materials imported from China was as follows: APT, 38%; tungsten oxide, 22%; tungsten metal powders, 9%; tungsten carbide powder and wrought tungsten, 8% each; ferrotungsten, 7%; unwrought tungsten, 6%; tungsten waste and scrap, 2%; other tungstates, other tungsten compounds, and tungsten ores and concentrates, less than 1% each. Other significant suppliers of tungsten materials to the United States were as follows: Canada, 12%; Bolivia, 8%; Germany, 6%; and Portugal, the Republic of Korea, and Spain, 4% each.

The tungsten contained in U.S. imports of ores and concentrates was slightly higher than that of 2012. In 2013, the leading suppliers of U.S. imports of tungsten ores and concentrates were Canada (31%), Bolivia (26%), Portugal (15%), Spain (13%), and Australia (7%) (table 11).

U.S. imports of APT were 48% higher than those of 2012 (table 12). China continued to be the dominant supplier, providing 85% of U.S. APT imports; most of the remaining APT imports were from Germany. Imports of other tungsten materials are presented in tables 13 and 14.

Net import reliance as a percentage of apparent consumption is used to measure the adequacy of current domestic production to meet U.S. demand. Net import reliance was defined as imports minus exports plus adjustments for Government and industry stock changes. Releases from stocks, including shipments from the NDS, were counted as part of import reliance, regardless of whether they were imported or produced in the United States. In 2013, U.S. net import reliance for tungsten as a percentage of apparent consumption was 41%, similar to the levels calculated for the previous 2 years. This indicates that about 40% of U.S. tungsten supply was from imports and stock releases, and about 60% was from scrap materials generated in the United States. Actual net import reliance might be lower if data for U.S. production of tungsten concentrates were available to be included in the calculation of apparent consumption. Net import reliance prior to 2011 was generally in the range of 60% to 70% because of lower levels of scrap consumption.

World Review

Estimated world tungsten mine production was 7% higher than that of 2012, primarily because of an increase

in production from China, which accounted for 84% of the total. Combined production outside of China increased by 8%, owing to increased production from Congo (Kinshasa) and Vietnam (table 15). In addition to mine production and tungsten recovered from scrap, tungsten materials from the NDS contributed to supply in 2013.

Australia.—Tasmania Mines Ltd. (Sydney, New South Wales) produced a small amount of scheelite concentrate from its Kara open pit magnetite mine south of Burnie in Tasmania.

Deutsche Rohstoff AG (DRAG) (Heidelberg, Germany) ramped up production at its Wolfram Camp open pit tungsten-molybdenum mine and upgraded beneficiation plant west of Cairns, Queensland, and announced the start of commercial production in November. DRAG planned to continue to make improvements to the plant to further increase production. Wolframite concentrate from Wolfram Camp was committed to U.S. tungsten processor Global Tungsten & Powders Corp. (GTP) under a 5-year offtake agreement (Deutsche Rohstoff AG, 2013).

Carbine Tungsten Ltd. (Sydney, New South Wales) was developing its Mt. Carbine tungsten mine west of Port Douglas in northern Queensland in three stages—processing tailings generated during past mining operations, processing stockpiled ore from past mining operations, and then open pit mining. In 2013, Carbine produced concentrates recovered from tailings and sold them under an offtake agreement to Mitsubishi Corporation RtM Japan Ltd. (Tokyo, Japan). During the year, Carbine worked to improve tungsten recovery from the tailings processing plant. With regard to processing stockpiled ore, Carbine and Mitsubishi worked on the technical and commercial details of the project and in December, the Department of Environment and Heritage Protection granted final approval for the project's plan of operations (Carbine Tungsten Ltd., 2014, p. 2–5).

King Island Scheelite Ltd. (KIS) (Sydney, New South Wales) investigated options for reducing the cost of reestablishing mining and processing operations at the former King Island Scheelite Mine on King Island, northwest of Tasmania. The company was considering open pit mining for 4 years, followed by underground mining for 9 years, supplemented by selective mining of relatively high-grade tailings from previous operations. Average production during the first 4 years of operation was forecast to be approximately 1,750 t/yr of tungsten in concentrate. In 2014, KIS planned to dewater the pit and confirm the resources, do additional metallurgical testwork for the redesigned processing circuit, and prepare a revised definitive feasibility study (King Island Scheelite Ltd., 2014).

Thor Mining PLC (London, United Kingdom) worked to improve its Molyhil tungsten-molybdenum project. The project comprised an open pit mine and beneficiation plant, to be constructed northeast of Alice Springs in the Northern Territory. Thor considered various options for reducing operating costs and investigated x-ray ore sorting to upgrade low-grade ore so that it could be beneficiated. By yearend, Thor had secured a letter of intent from GTP to purchase 70% to 75% of the tungsten concentrate to be produced at Molyhil, subject to Thor securing funding needed to develop the project (Thor Mining PLC, 2014, p. 3–4).

Venture Minerals Ltd. (Subiaco, Western Australia) worked towards obtaining State and Commonwealth approvals and environmental permits for its Mt. Lindsay tin-tungsten project in northwest Tasmania. Venture planned to mine the ore by open pit and underground methods for 9 years and to include a circuit for producing APT in the processing plant (Venture Minerals Ltd., 2014).

Vital Metals Ltd. (Subiaco, Western Australia) studied the feasibility of increased production from its Watershed project northwest of Cairns, Queensland. Vital's initial feasibility study was for an open pit mining operation capable of producing approximately 1,560 t/yr of tungsten in scheelite concentrates, with an initial mine life of 6 years. During the year, the Department of Natural Resources & Mines granted mining leases for the project, so that by yearend it was fully permitted and Vital was authorized to begin construction. Japan Oil, Gas and Metals National Corp. (JOGMEC) had a 30% interest in the project, which it intended to transfer to a Japanese company with an offtake interest and responsibility for arranging a share of the project financing (Strizek, 2011, p. 18; Vital Metals Ltd., 2014, p. 1–2).

Austria.—Wolfram Bergbau und Hütten AG (owned by Sandvik AB, Sandviken, Sweden) operated the Mittersill scheelite mine and beneficiation plant in the State of Salzburg, and the Bergla tungsten processing plant and a tungsten recycling unit near St. Martin in the State of Styria. The Mittersill Mine supplied some of the concentrate feed for the Bergla processing plant; the remainder was imported. During the year, Wolfram Bergbau invested in mine vehicles, maintained Mittersill's ore reserves through exploration drilling, began using sorting technology on Mittersill ore, and doubled the St. Martin recycling unit's capacity to process cemented carbide scrap (Bundesministerium für Wissenschaft, Forschung und Wirtschaft, 2014, p. 33; Sandvik AB, 2014, p. 45).

Brazil.—Bodo Mineracao (a subsidiary of Brazilian Tungsten Holdings Ltd.) re-treated tailings from former mining operations at the Bodo scheelite mine, Rio Grande do Norte State (Hack, 2014)

Largo Resources Ltd. (Toronto, Ontario, Canada) maintained its Currais Novos project on care-and-maintenance status owing to severe drought conditions. The project was designed to reprocess tailings generated by past production from two former tungsten-molybdenum mines west-southwest of Natal, Rio Grande do Norte State (Largo Resources Ltd., 2014, p. 5).

Canada.—North American Tungsten Corp. Ltd. (NATC) (Vancouver, British Columbia) produced slightly less tungsten in scheelite concentrates from its Cantung operation in the Northwest Territories than in 2012, in part because of lower ore grades mined during the fourth quarter. The company began a project to increase Cantung's mill throughput by as much as 20% and to increase metallurgical recovery from the gravity and flotation circuits. In the summer, NATC began mining and stockpiling ore from an open pit near the underground mine, which would be processed after the mill throughput had increased. NATC studied the potential to produce tungsten concentrates from tailings generated during past mining at Cantung and continued to provide information to the Yukon Environmental and Socio-economic Assessment Board for the

development of its Mactung scheelite deposit in the Yukon (North American Tungsten Corp. Ltd., 2014, p. 3–5).

Northcliff Resources Ltd. (Vancouver, British Columbia) completed a feasibility study on its Sisson tungsten-molybdenum project and submitted an environmental impact assessment to the Federal and Provincial governments. The project, in east-central New Brunswick, comprised an open pit mine, a beneficiation plant to produce tungsten and molybdenum concentrates, and an onsite processing plant to convert the tungsten concentrate to APT. The mine life was expected to be 27 years and APT production was expected to average approximately 5,460 t/yr of contained tungsten during the first 5 years of operation and approximately 4,420 t/yr of contained tungsten during the life of the mine. During the year, Todd Corp. (Wellington, New Zealand) acquired an 11.5% interest in the project and a 15% interest in Northcliff (Northcliff Resources Ltd., 2013; 2014, p. 9, 11, 25).

China.—In 2013, China's production of concentrates increased to an estimated 68,000 t of contained tungsten. Despite its position as the world's leading miner of tungsten, China has imported significant quantities of tungsten concentrates in recent years. In 2013, China imported 5,164 t of tungsten in concentrates. Scrap recycling contributed an additional 10,000 t of tungsten to China's raw materials supply. Based on supply (mine production plus imports and recycled tungsten), domestic consumption, and exports, one analyst estimated that, in 2013, the Chinese market had a tungsten surplus of 15,680 t and another analyst estimated a surplus of 25,400 t (Tungsten & Molybdenum Monthly, 2014b; Xiao, 2014, p. 13, 16, 36).

China's Government maintained a program to conserve its tungsten resources and to ensure that its tungsten supply would meet anticipated demand. The program included regulating the production of tungsten concentrates through exploration and mine licenses, mine closures, and production quotas; regulating the processing of tungsten concentrates; and regulating tungsten exports by issuing export licenses, imposing export taxes, and restricting the volumes and types of tungsten materials and products that could be exported. For 2013, the tungsten concentrate production quota remained at 89,000 t (65% WO₃) with 80% as primary mine production and 20% as comprehensive recovery from other sources. China's mine production is typically higher than the quota. For example, the 2013 quota of 89,000 t (65% WO₃) was equivalent to approximately 45,900 t of contained tungsten, but production was estimated to be 68,000 t of contained tungsten. The excess production was attributed to excess production under the comprehensive recovery category, production by trading companies that was not controlled by the quota, and double-counting. In 2013, China's export quota remained at 15,400 t of tungsten contained in materials and products (Tungsten & Molybdenum Monthly, 2014b; Xiao, 2014, p. 6–8, 27).

In 2013, China's State Reserve Bureau reportedly purchased tungsten concentrates for its national stockpile. Additional purchases in 2014 and 2015 were anticipated (Tungsten & Molybdenum Monthly, 2014a).

The Ganzhou Tungsten Association issued monthly recommended prices for wolframite concentrate, APT, and

tungsten carbide powder; China Minmetals Corp. issued monthly recommended prices for scheelite and wolframite concentrates (Tungsten & Molybdenum Monthly, 2013).

Colombia.—The Colombian National Police reportedly planned to seize and close the Tiger Hill wolframite mine in the Amazon jungle. The mine was operated illegally by Revolutionary Armed Forces of Colombia (FARC), a guerrilla organization (Smith and Willis, 2013).

Congo (Kinshasa).—As discussed in the “Legislation and Government Programs” section of this report, companies reporting to the U.S. Securities and Exchange Commission are subject to the conflict minerals rules in the Dodd-Frank Wall Street Reform and Consumer Protection Act with regard to tungsten exports from Congo (Kinshasa) and adjoining countries.

Germany.—H.C. Starck GmbH expanded the production capacity at its tungsten processing plant in Goslar, Lower Saxony (H.C. Starck GmbH, 2014).

Korea, Republic of.—Woulfe Mining Corp. (Vancouver, British Columbia, Canada) worked with IMC International Metalworking Companies B.V. (Gouda, Netherlands) to finalize agreements for IMC to help finance the reopening of the Sangdong tungsten-molybdenum mine southeast of Seoul in Gangwon Province. The project comprised an underground mine and a beneficiation plant that would use mineral flotation to produce scheelite concentrate, an intermediate tungsten product, and a bulk sulfide concentrate containing bismuth and molybdenum. The companies planned to establish a joint-venture company to build an APT plant in the Republic of Korea, which would process 90% to 100% of the scheelite concentrate produced from the mine and IMC would acquire 90% to 100% of the APT produced under an offtake agreement. During the year, Woulfe reviewed the 2012 feasibility study prepared for the project and determined that additional work was necessary to better define the ore body, complete the mine design, select a mining method, design the metallurgical process, and derisk other technical aspects of the project. Woulfe expected this work to take about 12 months to complete (Woulfe Mining Corp., 2014, p. 2–5).

Peru.—Malaga Inc.’s Pasto Bueno Mine and beneficiation plant in the Ancash region remained on care-and-maintenance status. At mid-year, Malaga announced its intention to file for bankruptcy (Malaga Inc., 2013).

Portugal.—Sojitz Beralt Tin and Wolfram (Portugal) S.A. (Barroca Grande) produced wolframite (ferberite) concentrate from the Panasqueira Mine and beneficiation plant in central Portugal. Concentrate from Panasqueira was sent to Japan, the United States, and elsewhere to be processed.

Russia.—In December 2012, the Government of Russia imposed a 10% export duty on tungsten concentrates in response to high levels of exports, which hampered military programs and national stockpiling. In 2013, five companies mined tungsten and produced concentrates. The companies, including the locations of their operations, and listed in order of their recent share of production, were as follows: JSC A&IR Mining, which produced concentrates from ores mined by Primorsky GOK in Primorskiy Kray; KGUP Primteploenergo, which had the exploration and mining license for the Lermontov Mine in

Primorskiy Kray; Russkaya Gornorudnaya Kompaniya (RGRK, the Russian Ore Mining Company), which managed JSC Novoorlovsky GOK in Zabaykal’sk Kray; Wolfram Company CJSC, which owned CJSC Buryat Wolfram in Zakamensk, Buryatiya Republic; and prospectors’ cooperative Artel Quartz Ltd. (Kvarz) in Zabaykal’sk Kray. Wolfram Company (Moscow) produced concentrate from tailings generated during previous mining. Wolfram Company’s Hydrometallurg plant at Nalchik, Kabardino-Balkariya Republic, and Kirovgradskiy Zavod Tverdykh Splavov OAO’s Kirovgrad Hard Alloys plant in Sverdlovsk Oblast produced APT, tungsten anhydride, and tungsten oxide (Gorbachev, 2013, p. 9–10, 13, 16).

Spain.—Daytal Resources Spain, S.L. (a subsidiary of Almonty Industries Inc., Toronto, Ontario, Canada) produced 510 t of tungsten in concentrate from its Los Santos Mine and beneficiation plant in Salamanca Province, 6% less than production in 2012. The lower production was attributed to reduced throughput at the plant during April and May while the company made improvements to the processing circuit, a temporary plant shutdown following a fire in late June, and a change in ore mineralogy. A faulty calibration of analysis equipment in March resulted in reduced recovery rates at the plant for the remainder of the year and delayed plant optimization until January 2014. Exploration during the year resulted in increased ore reserves, which were expected to extend the mine’s life to 9 years, and provided information to optimize the pit design and long-term mine plan. Higher ore grades and optimized beneficiation are expected to increase future production (Almonty Industries Inc., 2014, p. 4–7).

W Resources PLC (London, United Kingdom) was constructing preconcentration and beneficiation plants to produce tungsten-tin concentrate from the La Parrilla tailings deposit in the Extremadura region in the Provinces of Badajoz and Caceres. The company planned to begin production in early 2014 and produce at a rate of approximately 220 t/yr tungsten and 26 t/yr tin (W Resources PLC, 2014).

Ormonde Mining PLC (Dublin, Ireland) worked on mine permitting and capital funding arrangements for its Barruecopardo tungsten project in Salamanca Province. Barruecopardo was the leading tungsten mine in Spain until its closure in the early 1980s. Ormonde planned to mine the ore by conventional open pit methods and use gravity methods to produce scheelite concentrates containing an average of 1,800 t/yr of tungsten during the initial 9 years of operation. Ormonde entered into an offtake agreement with Noble Resources International Pte. Ltd., under which Noble would purchase all of the tungsten concentrate produced from the mine during its first 5 years of operation (Ormonde Mining PLC, 2014, p. 2, 6).

Taiwan.—Taiwan Wolfram Metal Industry Co., Ltd. was constructing an APT plant in Taiwan Zhang Bing Industrial Park. The plant, which was to have the capacity to produce about 4,000 t/yr APT and 1,000 t/yr tungsten trioxide, was scheduled to begin production in early 2014 (Hong Kong Wolfram International Investment Co., Ltd., undated).

United Kingdom.—During the year, Wolf Minerals Ltd. (Subiaco, Western Australia, Australia) worked on the financing, permitting, property purchases, and lease negotiations needed

to begin construction of its Hemerdon project northeast of Plymouth. The company planned to begin construction in early 2014 on an open pit mine and beneficiation plant that were expected to produce approximately 2,700 t/yr of tungsten in wolframite concentrate and 450 t/yr of tin in concentrate for a minimum of 10 years. Wolf Minerals had offtake contracts with GTP and Wolfram Bergbau for the tungsten concentrate to be produced (Wolf Minerals Ltd., 2014).

Vietnam.—In April, Vietnam Youngsun Tungsten Industry Co., Ltd. temporarily suspended operations at its ferrotungsten plant in Halong City, Quang Ninh Province, to repair an electrical fault. After the plant was restarted in June, the company reportedly announced that it planned to reduce production by 50% during the second half of the year owing to unreliable power supply. The plant used ore from the Thien Ke tungsten mine in Tuyen Quang Province to produce ferrotungsten (Hack, 2013).

Hazelwood Resources Ltd. commissioned its majority-owned Asia Tungsten Products ferrotungsten plant in the Vinh Bao district near the port of Haiphong. Between April 2013 and January 2014, Hazelwood processed a range of different feed materials in three campaigns to produce 528 t of ferrotungsten containing an estimated 406 t of tungsten. The plant was designed to produce 4,000 t/yr of ferrotungsten (approximately 3,000 t/yr of tungsten). Hazelwood planned to ramp up production as follows: 1,500 t ferrotungsten (1,100 t tungsten) in 2014 and 2,600 t ferrotungsten (2,000 t tungsten) in 2015 (Hazelwood Resources Ltd., 2014, p. 3, 7–8).

Masan Resources Corp. (Ho Chi Minh City) commissioned its Nui Phao project in Thai Nguyen Province, increased plant throughput to 100% of design capacity levels, and shifted its focus to debottlenecking plant throughput and increasing mineral recovery rates. The project comprised an open pit mine and processing complex to produce fluor spar, copper concentrate, APT, and bismuth, listed in order of annual output. During the year, Masan and H.C. Starck established a joint venture for processing Nui Phao tungsten concentrate into APT and blue tungsten oxide. The joint venture's plant was to have the capacity to produce 6,500 t/yr of tungsten trioxide (about 5,150 t/yr of contained tungsten) (H.C. Starck GmbH, 2013; Masan Group Corp., 2014).

Outlook

World tungsten supply will continue to be dominated by China's production and exports. The Chinese Ministry of Land and Resources maintained the total tungsten production quota for 2014 at 89,000 t (65% WO₃), equal to that of 2012 and 2013, and extended the ban on issuing new mining licenses to June 30, 2015. The 2014 export quota, at 15,400 t of contained tungsten, was unchanged from that of 2012 and 2013 (Metal-Pages, 2014; Xiao, 2014, p. 6).

In the next few years, tungsten concentrate production from outside China is expected to increase. As discussed in the "World Review" section of this report, numerous companies worked to develop tungsten deposits, produce tungsten concentrate from stockpiled tailings, or restart production from inactive mines in Asia, Australia, Europe, North America,

and South America. The amount, location, and timing of future production will depend on the companies' ability to acquire funding. Increased production capacity for APT outside China is also planned. Scrap will continue to be an increasingly important source of raw material for the tungsten industry worldwide.

Tungsten consumption is strongly influenced by general economic conditions. Future consumption of tungsten in cemented carbides, which is the leading end-use sector, will depend on the performance of the following industries: automotive and aircraft production; construction; electronics manufacturing, where cemented carbide microdrills are used on circuit boards; general manufacturing; large equipment manufacturing; mining; and oil and gas drilling. Tungsten use is also influenced by Government spending for defense applications.

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TABLE 1
SALIENT TUNGSTEN STATISTICS¹

(Metric tons, tungsten content and dollars per metric ton unit)

	2009	2010	2011	2012	2013
United States:					
Concentrates:					
Production	NA	NA	NA	NA	NA
Consumption	W	4,820	W	W	W
Exports	38	276	169	203	1,060
Imports for consumption	3,590	2,740	3,640	3,650	3,690
Stocks, December 31:					
Consumer	W	W	W	W	W
U.S. Government ²	19,000	17,000	15,800	14,000	11,900
Price:					
U.S. spot quotation ³	151	183	248	358	358
European ^{4,5}	150	150	150	XX	XX
Ammonium paratungstate:					
Production	W	W	W	W	W
Consumption ⁶	6,860	10,300	W	W	W
Stocks, December 31, producer and consumer	100	62	W	W	W
Price:					
U.S. free market ^{4,7}	204	214	370	XX	XX
U.S. market ³	178	186	397	449	369
European free market ⁸	203	244	431	386	372
Primary products:					
Net production ⁹	5,300	8,340	7,790	6,360	6,150
Consumption ¹⁰	7,550 ^r	11,000 ^r	12,300 ^r	11,400 ^r	10,700
Stocks, December 31:					
Producer ⁹	682	678	682	653	769
Consumer ¹⁰	509	567	558	706 ^r	646
U.S. Government ²	171	171	125	125	125
World, production of concentrate	61,200	68,400 ^r	73,900	76,400 ^r	81,400 ^e

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

¹Data are rounded to no more than three significant digits.

²Data from Defense Logistics Agency Strategic Materials. Data are uncommitted material only.

³Annual average calculated from weekly prices reported by Platts Metals Week or Platts Metals Daily.

⁴Annual average calculated from semiweekly prices reported by Metal Bulletin.

⁵Price discontinued October 26, 2012.

⁶Reported by tungsten processors.

⁷Price discontinued July 18, 2012.

⁸Data for 2009–12 are annual averages calculated from semiweekly prices reported by Metal Bulletin. Datum for 2013 is annual average calculated from monthly prices reported by Metal Bulletin.

⁹Includes tungsten metal powder and tungsten carbide powder produced from metal powder; excludes cast and crystalline tungsten carbide powder and chemicals.

¹⁰Includes ammonium paratungstate and other tungsten chemicals, ferrotungsten, tungsten metal powder, tungsten carbide powder, and tungsten scrap.

TABLE 2
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE TUNGSTEN STATISTICS IN 2013^{1,2}

(Metric tons, tungsten content)

Material	Inventory, yearend ³		Annual Materials Plan ⁵	Sales		Inventory decrease ⁴	
	Fiscal year ⁵	Calendar year		Fiscal year ⁵	Calendar year	Fiscal year ⁵	Calendar year
Ores and concentrates	12,100	11,900	2,300	2,240	2,080	2,140	2,100
Tungsten metal powder	125	125	35	--	--	4 ⁶	--
Total	12,200	12,000	2,330	2,240	2,080	2,140	2,100

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes stockpile- and nonstockpile-grade materials.

³Uncommitted inventory only. Does not include material committed for sale pending shipment.

⁴From previous year. Based solely on uncommitted yearend inventories.

⁵Twelve-month period ending September 30, 2013.

⁶Inventory adjustment.

Source: Defense Logistics Agency Strategic Materials.

TABLE 3
U.S. NET PRODUCTION AND STOCKS OF TUNGSTEN PRODUCTS^{1,2,3}

(Metric tons, tungsten content)

	Tungsten metal powder	Tungsten carbide powder	Total
Net production:			
2012	W	W	6,360
2013	W	W	6,150
Producer stocks:			
December 31, 2012	300	353	653
December 31, 2013	W	W	769

W Withheld to avoid disclosing company proprietary data.

¹Net production equals receipts plus gross production minus quantity used to make other products listed.

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Data for cast and crystalline tungsten carbide powder and tungsten chemicals are withheld to avoid disclosing company proprietary data; not included in "Total."

TABLE 4
U.S. PROCESSORS OF TUNGSTEN IN 2013¹

Company	Plant location
Buffalo Tungsten Inc.	Depew, NY.
Chem-Met Co., The	Clinton, MD.
Elmet Technologies, Inc.	Lewiston, ME.
General Electric Co.	Euclid, OH.
Global Tungsten & Powders Corp. ²	Towanda, PA.
Kennametal Inc.	Fallon, NV.
Do.	Huntsville, AL. ³
Do.	Latrobe, PA.
Tungsten Diversified Industries LLC ⁴	White Bear Lake, MN. ⁵

Do. Ditto.

¹Consumers of ammonium paratungstate, tungsten-bearing scrap, tungsten concentrates, and (or) tungsten oxides.

²A division of Plansee Group.

³Formerly ATI Alldyne (an Allegheny Technologies Inc. company).

⁴Joint venture of North American Tungsten Corp. Ltd., Tundra Particle Technologies LLC, and Queenwood Capital Partners LLC.

⁵Pilot-scale operation.

TABLE 5
U.S. REPORTED CONSUMPTION AND STOCKS OF TUNGSTEN PRODUCTS^{1,2,3}

(Metric tons, tungsten content)

	2012	2013
Consumption by end use:		
Steels	123	86
Superalloys	586 ^r	447
Other alloys ⁴	W	W
Cemented carbides ⁵	6,800	6,260
Mill products made from metal powder	W	W
Chemical	90 ^r	88
Total	11,400 ^r	10,700
Consumption by form:		
Ferrotungsten	165	97
Tungsten metal powder	W	W
Tungsten carbide powder	7,030 ^r	6,510
Tungsten scrap ⁶	W	W
Other tungsten materials ⁷	90 ^r	88
Total	11,400 ^r	10,700
Consumer stocks, December 31:		
Ferrotungsten	W	W
Tungsten metal powder	41 ^r	33
Tungsten carbide powder	471	412
Tungsten scrap ⁶	W	W
Other tungsten materials ⁷	10 ^r	13
Total	706 ^r	646

¹Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Does not include materials used in making primary tungsten products.

⁴Includes estimates.

⁵Includes welding and hard-facing rods and materials, wear- and corrosion-resistant alloys, and nonferrous alloys.

⁶Includes diamond tool matrices, cemented and sintered carbides, and cast carbide dies or parts.

⁷Includes tungsten bars.

⁸Includes tungsten chemicals.

TABLE 6
U.S. EXPORTS OF TUNGSTEN ORES AND CONCENTRATES, BY COUNTRY¹

Country of destination	2012			2013		
	Quantity		Value (thousands)	Quantity		Value (thousands)
	Gross weight (metric tons)	Tungsten content ² (metric tons)		Gross weight (metric tons)	Tungsten content ² (metric tons)	
Brazil	15	8	\$259	2	1	\$304
Canada	7	3	110	2	1	30
China	299	154	2,480	759	392	11,400
Germany	7	4	114	90	46	210
Hong Kong	--	--	--	180	93	2,490
Japan	33	17	441	--	--	--
Malaysia	(3)	(3)	7	4	2	251
Netherlands	--	--	--	103	53	1,980
Poland	--	--	--	11	6	117
United Kingdom	(3)	(3)	5	38	19	549
Vietnam	30	15	348	861	444	16,000
Other	3 [†]	1 [†]	42 [†]	2	1	206
Total	394	203	3,800	2,050	1,060	33,600

[†]Revised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Content estimated from reported gross weight.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF AMMONIUM PARATUNGSTATE, BY COUNTRY^{1,2}

Country of destination	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	--	--	(3)	\$3
Austria	--	--	(3)	3
Belgium	1	\$9	--	--
Czech Republic	--	--	49	1,070
Germany	534	10,600	516	8,640
Hungary	51	820	101	1,690
India	20	180	28	251
Italy	1	19	1	13
Mexico	--	--	3	39
Switzerland	224	4,820	902	19,700
Taiwan	(3)	6	(3)	6
United Kingdom	2	16	1	10
Total	833	16,500	1,600	31,400

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes other ammonium tungstates, such as ammonium metatungstate.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF TUNGSTEN METAL POWDERS, BY COUNTRY^{1,2}

Country of destination	2012			2013		
	Quantity		Value (thousands)	Quantity		Value (thousands)
	Gross weight (metric tons)	Tungsten content ³ (metric tons)		Gross weight (metric tons)	Tungsten content ³ (metric tons)	
Argentina	6	5	\$280	(4)	(4)	\$22
Australia	8	7	348	7	6	281
Austria	25	20	1,260	6	5	237
Belgium	1	1	70	2	2	71
Brazil	19	16	1,080	15	12	902
Cambodia	--	--	--	2	2	200
Canada	149	119	9,630	101	81	6,910
Chile	6	5	355	2	2	155
China	26	21	2,260	31	25	2,170
Colombia	2	2	114	--	--	--
Ecuador	(4)	(4)	9	2	2	86
France	2	2	150	11	9	548
Germany	156	125	13,400	96	77	8,290
Hong Kong	1	(4)	31	2	2	243
India	32	26	2,300	38	30	2,750
Ireland	10	8	414	2	2	134
Israel	10	8	530	6	5	390
Japan	23	19	1,990	36	29	2,670
Korea, Republic of	10	8	581	4	3	388
Mexico	12	9	813	10	8	753
Netherlands	(4)	(4)	18	9	7	350
Norway	2	2	80	1	1	40
Panama	--	--	--	4	3	154
Philippines	1	1	156	4	3	204
Saudi Arabia	197	157	7,480	95	76	4,630
Singapore	26	21	1,630	31	25	2,060
South Africa	5	4	404	6	4	558
Sweden	4	3	277	(4)	(4)	7
Switzerland	--	--	--	10	8	627
Taiwan	36	29	3,300	18	14	1,520
Turkey	15	12	978	6	4	312
United Kingdom	5	4	297	2	2	157
Venezuela	(4)	(4)	40	4	3	294
Other	6	5	512 ^r	6	5	479
Total	797	637	50,800	569	455	38,600

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²May include tungsten alloy powders.

³Content estimated from reported gross weight.

⁴Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF TUNGSTEN CARBIDE POWDER, BY COUNTRY¹

Country of destination	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	11	\$607	22	\$973
Austria	79	1,910	40	627
Belgium	1	70	2	209
Brazil	17	824	19	1,030
Canada	96	5,730	121	6,990
Chile	2	114	(2)	9
China	54	2,810	107	3,650
Colombia	5	156	(2)	12
Czech Republic	(2)	26	43	2,010
Denmark	6	262	3	171
Ecuador	2	114	(2)	26
France	5	212	9	440
Germany	125	9,500	202	12,200
Hong Kong	3	171	2	148
India	2	152	36	2,040
Indonesia	3	164	4	215
Ireland	20	1,200	2	122
Israel	8	172	17	241
Italy	13	647	4	238
Japan	28	1,400	32	1,920
Korea, Republic of	7	616	5	517
Luxembourg	2	36	52	814
Malaysia	(2)	35	3	170
Mexico	19	1,860	13	1,290
Netherlands	2	58	(2)	3
Peru	9	552	1	108
Poland	3	119	--	--
Saudi Arabia	5	138	10	431
Singapore	6	643	7	713
South Africa	8	442	7	346
Sweden	33	2,080	2	125
Switzerland	3	275	3	262
Taiwan	67	4,380	67	4,330
Thailand	1	65	2	147
United Arab Emirates	(2)	57	4	283
United Kingdom	197	13,400	41	2,280
Venezuela	32	1,580	16	1,110
Other	4 [†]	234 [†]	4	453
Total	878	52,800	901	46,700

[†]Revised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY¹

Product and country of destination	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Ferrotungsten and ferrosilicon tungsten:				
Brazil	--	--	6	\$14
India	--	--	2	4
Japan	--	--	4	88
Korea, Republic of	--	--	6	26
Mexico	1	\$11	3	224
Netherlands	--	--	9	299
Other	(2)	21	1	118
Total	2	32	31	774
Unwrought tungsten:^{3,4,5}				
Austria	43	886	3	14
Belgium	9	32	13	53
Brazil	46	366	19	79
Bulgaria	2	6	5	20
Canada	609	2,710	552	2,440
China	24	100	14	71
France	39	166	1	3
Germany	13	57	155	659
Hong Kong	13	54	--	--
India	10	44	5	21
Indonesia	72	328	18	77
Japan	36	151	15	63
Malaysia	7	29	3	11
Mexico	72	318	41	183
Netherlands	15	319	--	--
Panama	12	53	24	100
Russia	--	--	10	44
Singapore	94	406	173	737
Switzerland	19	78	34	143
Taiwan	11	45	3	11
Thailand	27	114	20	87
Turkey	51	216	1	5
United Kingdom	39	328	35	149
Vietnam	12	32	--	--
Other	16 ^r	79 ^r	16	89
Total	1,290	6,920	1,160	5,060
Waste and scrap:⁴				
Australia	47	401	23	196
Austria	--	--	18	637
Belgium	--	--	47	397
Brazil	13	121	10	93
Canada	120	1,160	88	1,060
China	31	552	21	177
Czech Republic	172	5,550	--	--
Finland	534	4,520	456	4,850
Germany	194	2,090	638	12,000
Hong Kong	24	334	109	920
India	23	214	1	5
Israel	167	1,410	59	844
Japan	515	4,350	131	1,670
Malaysia	10	91	--	--
Poland	--	--	104	2,570
Sweden	249	2,400	70	594
Taiwan	13	107	4	30
United Kingdom	414	3,640	469	4,100

See footnotes at end of table.

TABLE 10—Continued
 U.S. EXPORTS OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY¹

Product and country of destination	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Waste and scrap:⁴—Continued				
Vietnam	92	\$776	--	--
Other	11 ^r	126 ^r	8	\$66
Total	2,630	27,800	2,250	30,200
Wrought tungsten:^{3, 4, 6}				
Australia	1	147	8	486
Austria	10	948	20	1,460
Brazil	4	706	3	668
Canada	28	3,660	42	6,220
China	16	1,960	22	1,740
Costa Rica	14	1,810	12	1,670
Czech Republic	17	2,140	1	209
Germany	45	5,600	34	3,170
Hungary	3	457	2	401
India	28	4,530	34	4,000
Israel	4	512	1	159
Italy	3	421	2	459
Japan	13	2,460	13	1,820
Korea, Republic of	3	821	2	816
Mexico	27	3,570	26	5,100
Russia	3	282	1	95
Singapore	10	1,440	8	1,080
Spain	(2)	12	2	170
United Kingdom	5	1,110	3	838
Venezuela	2	182	(2)	66
Other	13 ^r	2,620 ^r	9	1,800
Total	246	35,400	246	32,400
Tungsten compounds:⁷				
Canada	5	19	2	7
China	3	38	1	10
Korea, Republic of	--	--	11	240
Malaysia	2	19	5	58
Other	(2)	11	(2)	35
Total	10	88	19	350

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

³May include alloys.

⁴Content estimated from reported gross weight.

⁵Includes bars and rods produced simply by sintering; excludes powders and waste and scrap.

⁶Includes bars and rods other than those produced simply by sintering; profiles, plates, sheets, strip, and foil; wire; and other wrought products.

⁷Includes only other tungstates.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF TUNGSTEN ORES AND CONCENTRATES,
BY COUNTRY¹

Country of origin	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	22	\$852	262	\$9,060
Bolivia	1,160	44,600	976	33,600
Brazil	138	4,120	24	745
Canada	345	10,700	1,140	33,300
Chile	13	439	--	--
China	14	483	(2)	17
Colombia	120	4,000	50	1,520
France	(2)	2	--	--
Germany	38	1,230	10	315
Israel	23	364	--	--
Mexico	18	310	14	355
Mongolia	40	2,980	--	--
Peru	293	11,600	--	--
Portugal	656	27,900	543	19,900
Russia	18	727	98	3,750
Rwanda	11	428	14	448
Singapore	--	--	8	265
Spain	547	21,400	464	16,200
Sweden	--	--	(2)	4
Thailand	87	3,750	76	3,180
United Kingdom	53	1,530	14	406
Vietnam	46	1,380	--	--
Total	3,650	139,000	3,690	123,000

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF AMMONIUM PARATUNGSTATE, BY COUNTRY^{1,2}

Country of origin	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
China	1,410	\$52,700	1,890	\$72,600
France	--	--	(3)	11
Germany	89	3,600	322	11,300
Japan	--	--	5	186
United Kingdom	(3)	2	--	--
Total	1,500	56,300	2,220	84,200

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes other ammonium tungstates, such as ammonium metatungstate.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 13
 U.S. IMPORTS FOR CONSUMPTION OF FERROTUNGSTEN AND
 FERROSILICON TUNGSTEN, BY COUNTRY¹

Country of origin	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Brazil	--	--	37	\$1,370
China	131	\$5,860	327	13,400
Germany	8	369	--	--
Hong Kong	--	--	15	690
Luxembourg	--	--	15	745
Netherlands	2	121	12	393
Sweden	--	--	1	30
Vietnam	175	7,820	63	2,620
Total	316	14,200	470	19,200

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 14
 U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS,
 BY COUNTRY¹

Product and country of origin	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Tungsten metal powders:²				
Austria	--	--	7	\$453
Canada	111	\$7,670	161	10,600
China	358	20,700	448	22,300
Czech Republic	--	--	9	415
Finland	3	130	--	--
France	1	32	3	69
Germany	175	12,400	172	11,100
Israel	179	12,600	123	8,670
Japan	17	1,700	7	592
Korea, Republic of	322	20,700	402	21,400
Poland	--	--	19	696
Singapore	53	3,910	40	2,570
United Kingdom	3	76	1	92
Vietnam	7	535	11	491
Other	1 ^r	171 ^r	3	224
Total	1,230	80,600	1,410	79,700
Tungsten carbide powder:				
Austria	67	4,020	135	8,340
Belgium	26	1,090	22	1,010
Canada	82	5,770	119	7,360
China	822	54,900	413	23,800
Czech Republic	--	--	9	511
France	10	916	12	1,220
Germany	135	12,200	81	6,170
Hong Kong	2	209	1	46
Israel	31	2,180	16	1,650
Japan	9	291	2	187
Korea, Republic of	19	1,460	9	594
Luxembourg	12	1,230	--	--
Netherlands	2	10	5	22
Vietnam	16	1,250	3	127
Other	3 ^r	232 ^r	1	165
Total	1,240	85,700	827	51,200
Unwrought tungsten:^{2,3,4}				
Austria	2	144	16	1,040
China	327	16,200	281	13,300
Germany	2	251	(5)	3
Hong Kong	8	406	1	36
United Kingdom	7	174	5	100
Vietnam	3	144	--	--
Other	3 ^r	371 ^r	2	59
Total	351	17,700	305	14,500
Waste and scrap:				
Austria	212	3,340	146	2,610
Canada	30	875	76	1,600
China	66	3,220	89	3,740
Czech Republic	35	1,240	25	852
Germany	187	5,040	78	2,430
Hong Kong	17	647	5	242
India	143	4,330	93	2,450
Israel	41	1,340	1	31
Japan	13	290	23	638
Korea, Republic of	101	2,230	8	211

See footnotes at end of table.

TABLE 14—Continued
 U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS,
 BY COUNTRY¹

Product and country of origin	2012		2013	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Waste and scrap:—Continued				
Luxembourg	184	\$5,370	241	\$9,380
Mexico	251	4,880	223	4,590
Pakistan	17	645	--	--
Poland	4	135	41	987
Singapore	19	307	11	128
South Africa	37	1,100	36	1,010
Sweden	69	2,120	85	3,440
United Kingdom	42	1,740	46	1,220
Other	29 ^r	1,020 ^r	70	2,410
Total	1,500	39,900	1,300	38,000
Wrought tungsten ^{2, 3, 6}				
Austria	56	9,940	42	8,460
China	523	32,300	407	25,600
France	4	1,040	1	669
Germany	17	3,270	28	5,370
Hong Kong	3	294	--	--
Hungary	8	1,880	9	1,340
Japan	20	5,480	16	5,090
Korea, Republic of	2	210	3	330
Luxembourg	4	93	(5)	60
Russia	13	1,470	4	559
Singapore	24	3,250	20	2,770
South Africa	1	29	7	238
United Kingdom	2	682	3	668
Other	7 ^r	2,270 ^r	8	2,240
Total	682	62,200	548	53,400
Tungsten oxides:				
Belgium	1	35	--	--
China	1,150	55,700	1,090	44,900
Germany	10	415	11	421
Hong Kong	8	385	--	--
Korea, Republic of	--	--	17	703
Russia	--	--	43	2,200
Vietnam	31	1,510	31	1,220
Total	1,200	58,000	1,190	49,400
Other tungstates:				
China	15	741	7	402
Germany	9	219	6	327
India	7	293	18	704
Ireland	--	--	3	225
Vietnam	--	--	169	5,520
Other	1	40	(5)	20
Total	32	1,290	204	7,200
Other tungsten compounds: ⁷				
Canada	--	--	1	24
China	--	--	3	57
Japan	7	2,270	5	1,150
Other	(5)	270	(5)	107
Total	7	2,540	9	1,330

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²May include alloys.

³Content estimated from reported gross weight.

⁴Includes bars and rods produced simply by sintering; excludes powders and waste and scrap.

TABLE 14—Continued
U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS,
BY COUNTRY¹

⁵Less than ½ unit.

⁶Includes bars and rods other than those produced simply by sintering; foil, plates, profiles, sheets, and strip; wire; and other wrought products.

⁷Includes tungsten chlorides.

Source: U.S. Census Bureau.

TABLE 15
TUNGSTEN: WORLD CONCENTRATE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons, tungsten content)

Country ³	2009	2010	2011	2012	2013 ^c
Australia	33	18 ^r	15	290 ^r	320 ⁴
Austria	887	977	861 ^r	706 ^r	850 ⁴
Bolivia ⁵	1,023	1,204	1,124	1,247 ^r	1,253 ⁴
Brazil	192	166	244 ^r	381 ^r	380
Burma ^{e,6}	87 ⁴	163 ⁴	140	140	140
Burundi	110 ^r	100 ^r	165 ^r	190 ^r	50
Canada	1,964	420	1,966 ^r	2,194	2,128 ⁴
China ^e	51,000	59,000	61,800	64,000	68,000
Congo (Kinshasa) ^{e,7}	200	25	70	95	830
Korea, North ^{e,8}	100	110	110	100	65
Mongolia	39	20	13	66 ^r	-- ⁴
Peru ⁹	502	571	439	276	28 ⁴
Portugal	823	799	819	763	692 ⁴
Russia	2,665	2,785	3,314	3,537 ^r	3,600
Rwanda ^e	380 ^r	330 ^r	520 ^r	700 ^r	730
Spain	225 ^r	240 ^r	497	542	510
Thailand ^{e,10}	190	300	160	80	100
Uganda	7	44	8	21	20
United States	NA	NA	NA	NA	NA
Vietnam ¹¹	725	1,150	1,635	1,050	1,660 ⁴
Total	61,200	68,400 ^r	73,900	76,400 ^r	81,400

^cEstimated. ^rRevised. NA Not available. -- Zero.

¹World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Includes data available through September 3, 2014.

³Tungsten concentrates are thought to be produced in Colombia and Nigeria, and may be produced from tin-tungsten ores in Kyrgyzstan, but information is inadequate to make reliable estimates of production.

⁴Reported figure.

⁵Production estimated based on reported exports.

⁶Includes tungsten content of tin-tungsten concentrate produced by state-owned mining enterprises under the Ministry of Mines.

⁷Production estimated based on reported exports from Nord-Kivu and Sud-Kivu Provinces.

⁸Production estimated based on Chinese imports.

⁹Data for 2009–12 are based on production reported by Malaga Inc.; datum for 2013 based on production reported by the Ministry of Energy and Mines.

¹⁰Based upon data from the Department of Primary Industries and Mines.

¹¹Mine production reported by the International Tungsten Industry Association.