THE SILVERINSTITUTE

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Silver News

Silver Industrial Demand Rose 11 Percent in 2023 Reaching a New Record

Silver Demand for Photovoltaics Increased 64 Percent, Surpassing Estimates

World Silver Supply & Demand (million ounces)
(totals may not add due to rounding)

	2022	2023
Supply		
Mine Production	836.7	830.5
Recycling	176.9	178.6
Net Hedging Supply	-	-
Net Official Sector Sales	1.7	1.6
Total Supply	**1,015.4**	**1,010.7**
Demand		
Industrial (total)	588.3	654.4
Electrical & Electronics	371.3	445.1
...of which Photovoltaics	118.1	193.5
Brazing Alloys & Solders	49.2	50.2
Other Industrial	167.8	159.0
Photography	27.5	27.0
Jewelry	234.5	203.1
Silverware	73.5	55.2
Net Physical Investment	337.1	243.1
Net Hedging Demand	17.9	12.2
Total Demand	**1,278.9**	**1,195.0**
Silver Price (US$/oz, London Price)	21.73	23.35

Source: Metals Focus

Overall, silver demand exceeded silver supply in 2023 for the third consecutive year, resulting in a structural market deficit of 184.3 Moz.

Record use of silver in industrial applications set a new high in 2023 at 654.4 million ounces (Moz). Ongoing structural gains from green economy applications underpinned these advances as they did in 2022. Higher than expected photovoltaic (PV) capacity additions and faster adoption of new-generation solar cells raised global electrical and electronics demand by a substantial 20 percent. At the same time, other green-related applications, including power grid construction and automotive electrification, also contributed to the gains.

These and many other key aspects of the 2023 silver market are examined in *World Silver Survey 2024*, released by the Silver Institute. The 88-page *Survey* also provides an outlook for this year's silver market. The *Survey* was researched and produced for the Silver Institute by Metals Focus, the London-based independent precious metals consultancy.

Silver Demand

Total silver demand in 2023 declined 7 percent to 1,195 Moz in 2023, but outstripped supply for the third consecutive year, resulting in a structural market deficit of 184.3 Moz, however. The price-sensitive physical investment, jewelry, and silverware sectors mainly contributed to last year's lower demand. In sharp contrast, industrial demand hit another record high, led by the electrical and electronics sector, which grew 20 percent to 445.1 Moz last year. This gain reflects silver's essential and growing use in PV, which recorded a new high of 193.5 Moz last year, increasing by a massive 64 percent over 2022's figure of 118.1 Moz.

Underpinning these overall gains was the limited scale of thrifting and substitution, as silver remains irreplaceable in many applications.

Chinese silver industrial demand rose by a remarkable 44 percent to 261.2 Moz, primarily due to growth for green applications, chiefly PV. Last year, China's rapid expansion of PV production accounted for over 90 percent of global panel shipments. Industrial demand in the United States stood at 128.1 Moz, essentially flat over 2022, while Japan's industrial offtake was also basically unchanged at 98.0 Moz.

Silver demand for ethylene oxide catalysts remained robust because of solid gains from capacity expansion. Brazing alloys rose by 2 percent due to increased mainstream end-uses, including automotive, aerospace, and shipbuilding in most major industrial countries. Silver jewelry fabrication fell by 13 percent in 2023 to 203.1 Moz. The losses were concentrated in India, where demand eased after reaching its highest total in 2022. Excluding India, total global losses were modest at 3 percent.

Silver Supply

Global silver mine production fell by 1 percent to 830.5 Moz in 2023. Output was significantly affected by the four-month suspension of operations at Newmont's Peñasquito mine in Mexico following a labor strike. Mexico's silver output fell by 5 percent to 202.2 Moz. Last year, Mexico was the leading silver mining country, followed by China, Peru, Chile, and Bolivia.

President and CEO of the Silver Institute Michael DiRienzo (second from left) with past Silver Institute Chairmen Eduardo Luna, Octavio Alvidrez, and Fernando Alanis at the Mexico City Launch of *World Silver Survey 2024*

Outlook for Silver in 2024

This year is expected to be a solid year for total silver demand, which is forecast to grow by 2 percent. Industrial fabrication should post another all-time high, rising by 9 percent, propelled by an anticipated 20 percent gain in the PV market and healthy offtake from other industrial segments. Jewelry and silverware fabrication are predicted to rise by 4 and 7 percent, respectively, while bar & coin demand is forecast to contract by 13 percent. Total silver supply should decrease modestly by 1 percent. As a result, this year, we will also see another large deficit for silver, amounting to a projected 215.3 Moz, the second-largest market deficit in more than 20 years. As outlined in the *Survey*, silver has many exciting new demand opportunities beyond its traditional applications and expanding role in the energy transition. For example, silver will become an indispensable material as artificial intelligence (AI) rises. End uses expected to incorporate silver in AI include transportation, nanotechnology, biotechnology, healthcare, consumer wearables, computing, and energy in data centers.

Silver Price

The average silver price grew by 7 percent in 2023, and as of April 12 this year, the price has increased by around 30 percent since the beginning of this year. As a result, the gold:silver ratio fell below 84:1, its lowest since early December 2023.

A complimentary PDF version of *World Silver Survey 2024* can be downloaded from the Institute's website at www.silverinstitute.org.

Silver Institute Membership Continues to Grow

The Silver Institute has recently welcomed five companies to its expanding membership.

The new members are: The Australian Bullion Company (ABC Bullion), based in Sydney, is Australia's leading precious metal and bullion specialist. Continuously trading for more than 50 years, they serve Australian investors in purchasing silver, gold, platinum, and palladium. Their ABC Refinery is accredited by the Shanghai Gold Exchange, the London Bullion Market Association, and the CME Group.

Bunker Hill Mining Corp. (CN: BNKR; OTCQB: BHLL) is a modern, sustainable mining company with the Bunker Hill Silver-Lead-Zinc Mine as its key asset. Headquartered in Kellogg, Idaho, they are led by an experienced management team of former executives from Barrick Gold Corporation, who plan to restart the mine this year.

Glencore (LSE:GLEN; JSE:GLN) is the world's fourth-largest silver mining company and one of the world's largest global natural resources companies, producing over 60 commodities. Based in Baar, Switzerland, and with offices in over 35 countries, Glencore produced 23.8 million ounces of silver in 2022.

Silver Bullion Pte Ltd is one of Singapore's largest precious metal dealers. It specializes in wealth protection and other services, including trading, vaulting, collateralizing, and non-destructive testing of metals at its ISO-9001-certified vault, The Safe House, located within its own building, The Reserve. With over 15,500 metric tons of storage capacity for precious metals, The Reserve is one of the world's highest-capacity vaults.

Sunshine Minting (SMI) is a full-service minting facility headquartered in Henderson, Nevada. SMI is a primary supplier of silver and gold products to several of the largest sovereign mints, capable of producing large volumes of high-quality bullion, blanks, coins, bars, and medallions. SMI has minting facilities in both Nevada and Idaho in the United States, and in Shanghai, China.

Phillips Baker, President and CEO of Hecla Mining Company and the Chairman of the Silver Institute, said, "We welcome the newest members to the Silver Institute. One of my goals as Chairman is to grow our membership and expand the Institute's role in communicating silver's vital role in our society, especially as a necessary catalyst for green energy applications, such as solar energy and global electrification efforts."

Short Zaps of Electricity Enhance Silver's Ability to Mitigate Malignant Cells

It is a long-held tradition in modern medicine to use as small a dosage as possible on a patient to reduce or eliminate any possible side effects. This presents healthcare providers with a dilemma: How small a dose can be administered without losing a remedy's effectiveness?

Although mitigating malignant cells with silver nanoparticles is generally safe, scientists are still unclear about any side effects of high doses. However, doctors have a choice, according to researchers at Mashhad University of Medical Sciences, Mashhad, Iran and other institutions.

Aiming extremely short electrical pulses at target cells enhances the ability of low levels of silver nanoparticles to enter the cells and destroy them. In simplest terms, the pulses open passageways for the silver nanoparticles to enter without having to fight their way through the tougher outside membrane. Therefore, only lower doses are necessary to be effective.

This technique, authors of a journal article suggest, can also be used to introduce other substances into a cell. They wrote: "… applying electric field in appropriate conditions facilitates entry of ions and foreign molecules such as drugs, hormones, proteins, plasmids and DNA into the cells."

The study was done in a laboratory along with computer modeling that offers data about how much electricity and how many nanoparticles are needed to kill cancer cells. "At last, a mathematical model, based on the experimental results, was used to predict the percent cell viability of cancerous cells affected by both silver nanoparticle and electric pulses," the report noted.

Many Factors Determine the Price of Silver, Report Notes

Silver's Role as Industrial Material and Precious Metal Makes Price Discovery Challenging

Determining the price of any commodity depends on many factors. Some are straightforward, such as supply and demand, but others are more difficult to assess because they may be affected by outside conditions that can vary or be unpredictable.

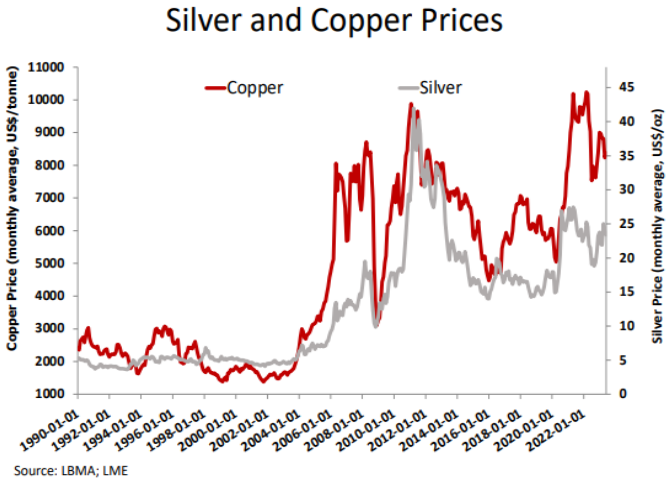
Silver is no exception, according to a recently-published Market Trend Report, *Factors that Determine the Silver Price*, produced by consultancy Precious Metals Insights and released by the Silver Institute. For example, the silver price can be affected by gold and copper prices, exchange rates, interest rates, inflation, and stock prices, not to mention overall economic conditions.

The report noted: "…there is no magic formula or combination of factors that consistently and accurately explains either the level of or change in the silver price. While the silver price is not a random walk neither is its future path entirely predictable based on past trends."

The report added that while some dominant factors, such as exchange rates or interest rates, may play a large role in the silver price during a certain period of time, those factors may recede during another time period. However, the report added that usually dominant factors like exchanges rates or interest rates have proved to have the strongest influence on the silver price over the long term.

Interestingly, unlike some commodities – gold, for example – silver's price is determined not only by its status as a precious metal but by industrial demand. The report stated: "Much of the time, it is those factors that typically drive investor behavior, such as the level of the dollar or interest rates, which are to the fore. But, at other times, silver moves more in line with changes in or expectations for those economic indicators that are especially relevant to commodities, such as industrial production and GDP growth.

Source: LBMA



Source: LBMA; LME

In its role as a precious metal, silver and gold prices often track together. However, as an industrial metal, silver and copper track together, too.

Illustrative of silver's dual nature is the metal's high correlation with gold but also, frequently, with copper and the broader commodities complex."

To download the complimentary Report, please click here.

Recycling Silver from Button Batteries Made Easier;

Yields Less Environmental Waste

With the enormous growth of consumer devices using button-type silver-oxide batteries (hearing aids and toys, for example) the need for silver is growing and could lead to a strain on its supply, according to researchers in Thailand, who have found a way to retrieve the silver in batteries in an environmentally friendly and scalable manner.

This discovery is timely as many jurisdictions are requiring or considering steps to ensure that all batteries be recycled instead of ending up in landfills. These laws are not only directed at larger lithium-type batteries used in heavy applications such as E-Bikes and lawnmowers but smaller single-use batteries as well.

In a recent journal article about their discovery the scientists at Chulalongkorn University in Bangkok wrote: "Batteries are considered indispensable energy storage components in electric devices due to their excellent cycle performance, compact size, high capacity, and long operating life." They added: "The global silver oxide market is expected to be driven using silver oxide batteries as the primary power source in a wide range of small portable electronic gadgets and appliances."

With this demand in mind, they have found a way to use hydrogen peroxide along with other chemicals that help to separate silver from silver oxide yielding the metal in microscopic form instead of the usually-retrieved, smaller nanoparticle size. "To isolate silver nanoparticles is difficult," the scientists explained. "Therefore, recovering silver in the form of microstructures is significantly more effective, since it can be readily purified though straightforward filtration resulting in substantial cost saving for large-scale industries." Another benefit of microsized silver instead of nanosized is that the shapes can be controlled and then used more easily in applications including jewelry manufacturing, electrical devices, and new batteries without any additional refining. In conclusion, they said: "The developed synthesis approach will facilitate the sustainable recovery of silver from spent button batteries, addressing the environmental, and resource challenges associated with battery waste."

NUEM

Button batteries are popular in many consumer items, but recycling the silver in them can be challenging.

Silver Films Reach a New, Thinner Level for Use in Optical Devices

In the world of optoelectronics, which includes devices such as electronic light sensors, engineers want the thinnest possible films made of silver that still retain the metal's electrical conductivity but are also transparent to light. This is a challenge because the usual method of thinning silver relies on mechanically pressing the metal until it reaches ultrathin dimensions on the order of 10 nanometers or 10-billionth of a meter. Unfortunately, this compression leads to degraded transparency and poor electrical conductivity because the silver film exhibits gaps and uneven areas.

A solution may have been found by scientists at the College of Mechanical and Vehicle Engineering, Hunan University, Changsha, Hunan Province, China and Jihua Laboratory, Foshan, Guangdong Province, China who have developed a process that deposits a thick layer of silver by using an ion beam generator that shoots charged silver atoms onto a substrate. The result is a very thick layer of silver that is then thinned by continuous ion bombardment and 'polishing' resulting in a uniform thickness of 4 to 5 nanometers.

In their report, the scientists wrote: "The atomic-level surface smooth permits excellent visible transparency, electrical conductivity, and the lowest haze among all existing transparent conductors. Moreover, the ultrathin silver film exhibits the unique robustness of mechanical flexibility. Therefore, the ion-beam thinning-back process presents a promising solution towards the excellent transparent conductor for flexible optoelectronic devices."

Ion beam bombardment of a surface is not a new technique. It is used in fabricating semiconductors and other electrical components, but this particular thinning method makes use of silver's ability to be made ultrathin, conductive and transparent without breaking.

10th Year Anniversary of Australian Raptor Silver Bullion Coin

The Wedge-Tailed Eagle, Australia's largest bird of prey and one of the biggest eagles in the world, has been commemorated for the 10th year in a row on a silver bullion coin from the Perth Mint.

The 2024 AUS$1 coin weighing 1.09 ounces has been sculpted by US artist John M. Mercanti. The eagle it depicts has a wingspan of 8.2 feet and the ability to reach almost 6,600 feet by using thermal air currents rising from Australia's hot terrain areas. The bird's territory is expansive, ranging across much of mainland Australia's mainland, Tasmania and as far north as New Guinea, according to Mint officials.

The coin also has a small "P125" mintmark, just below the King's likeness, honoring the Mint's 125th anniversary in 2024.

The coin is limited to 50,000 and retails for about US$35.

2024 is the 10th year that the Perth Mint has produced the Wedge-Tailed Eagle bullion coin.

THE PERTH MINT

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