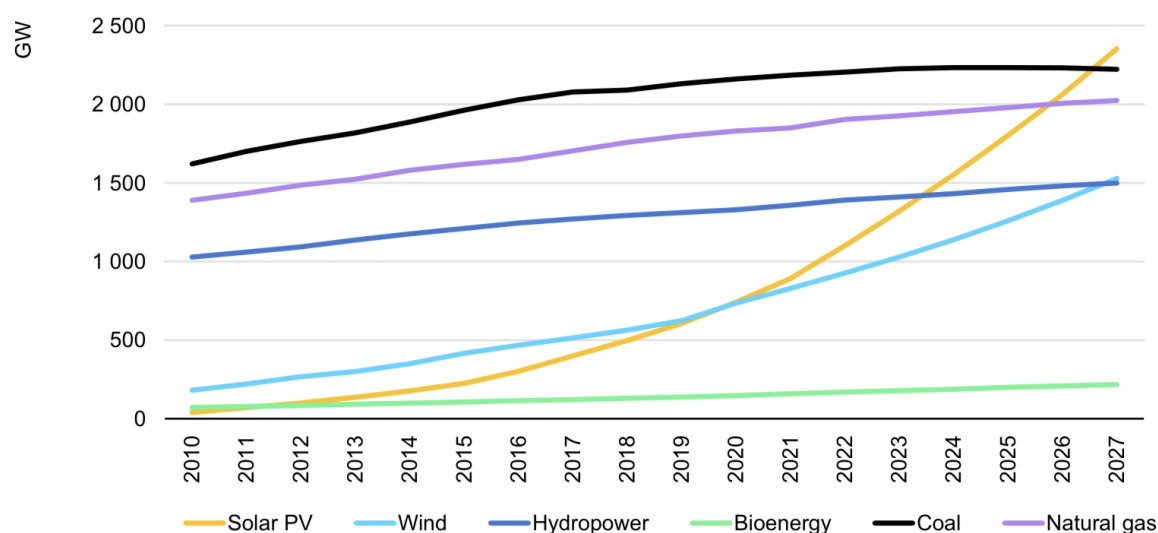


# The great bull case of silver for 2023 and beyond

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chenpicks.com  
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We are at the historical moment that Solar PV is having explosive growth into the next decade. According to the International Energy Agency report published in December, 2022, Solar will generate more power than any other sources, including coal, natural gas and hydro power by 2027, only 4+ years from now. There are talks that by the end of this decade, solar panels will be on every window, every car and even every laptop and cell phone. Solar power will replace fossil fuel to become the choice of mankind in 10 years.

**Figure 1.8 Cumulative power capacity by technology, 2010-2027**



IEA. CC BY 4.0.

Source: IEA analysis based on [World Energy Outlook 2022](#). (2022), Fossil fuel capacity.

From my Chinese sources, where most of the solar panels are manufactured, I heard a similar conclusion: The solar panel production will see explosive growth for decades to come. We are only at the beginning of the major sea change of future energy. **This is very similar to electrical vehicles, for example. Once the technology matures, explosive growth follows.** Solar PV is already the cheapest energy source available, future improvements will make it even more efficient. Note this is the most conservative estimate of the solar growth for the next 30+ years by two very reputable firms.

图：碳中和框架下光伏长周期高景气发展

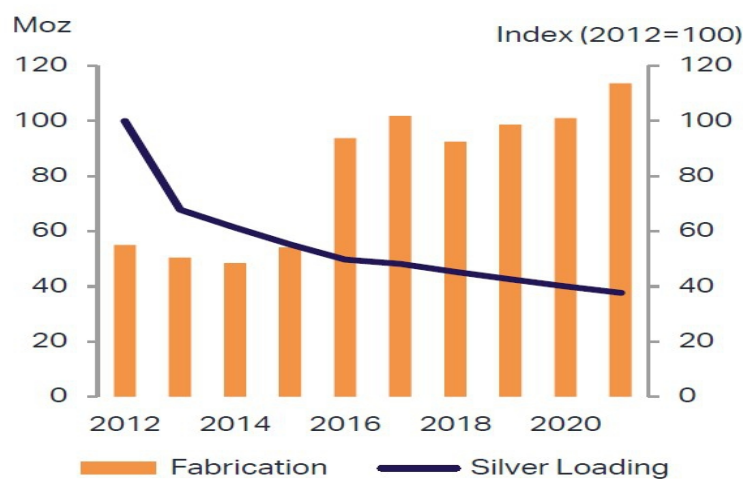


资料来源: Bloomberg, 长江证券研究所 Data sources: Bloomberg and Changjiang Securities

Solar PV is the biggest industry usage of silver. In 2021, solar PV used 13% of total silver demand, about 120 million oz of silver is used in the solar panel. This number will go up dramatically in the coming years that will lead to a significant silver deficit for years, if not decades, to come.

Silver loading, actual silver used in each solar panel, has been on a slow down trend in the past decade, due to improved efficiency in the solar panel industry. However, this will start to change in 2023.

### PV Silver Demand & Cell Loadings\*



\*denotes silver loadings per photovoltaic cell;  
Source: GTM, Metals Focus

Source: Silver institute report, 2022.

2023 is the year of TOPCON, a new solar panel technology that requires significantly higher silver loading. This is due to TOPCON adding another layer over the traditional PERC solar cell which needs more silver to be added in the wiring.

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## SOLAR ANALYTICA.

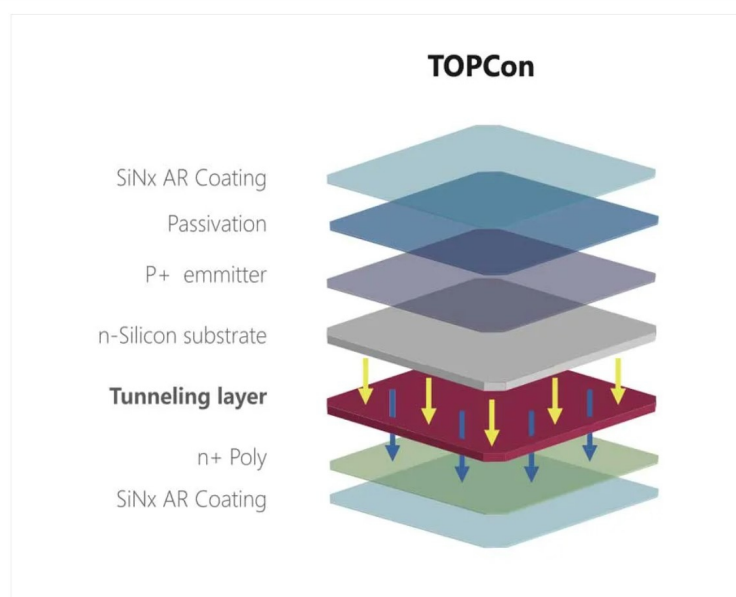


Figure 2: TOPCon exploded view (Solar 2021)

The TOPCon cell also requires substantially more silver in the metallization than PERC, around 130-150mg per piece versus 85mg with PERC, driving up cell costs even higher. Another concern is the cost of human resources, which is higher for TOPCon and more difficult to minimise when compared to HJT due to the latter's complex nine or even ten production procedures. Despite these obstacles, leading PERC cell manufacturers are still working on TOPCon. Jinko officially stated that "When comparing TOPCon to HJT in numerous dimensions, we (Jinko) currently stand [for] TOPCon," (Shaw 2021).

Source: Solar Analytica, 2022

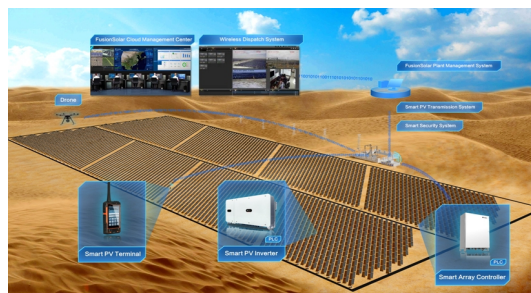
If we look further, the next generation solar panel technology HJT, uses even more silver. HJT is expected to take off around 2024-25. By 2025, estimated more than 50% of solar panels will be either TOPCON or HJT technology.

	N型电池工艺	P-PERC (基准)	TOPCON	HJT
Lab Efficiency	实验室效率	24.06% (隆基)	25.4% (中来)	26.3% (隆基)
	量产效率	22.8%-23.2%	23.5%-24.5%	23.5%-24.5%
	量产难度	工序中等; 难度低	工序多; 难度中低	工序少; 难度中高
Cost(RMB/W)	生产成本	约0.6-0.8元/W	约0.7-0.9元/W	约1.0-2.0元/W
Silver Usage	银浆耗量	80mg/片	100-120mg/片	200-220mg/片
	薄片化	170-190μm	150-160μm	90-140μm
	产线兼容度	目前主流产线	可升级PERC产线	完全不兼容PERC
	设备投资	2亿元/GW	2.5亿元/GW	4.5亿元/GW
	量产成熟度	已成熟	已成熟	即将成熟
2022 production	2022年产能预测	200GW以上	40GW以上	10GW以下

资料来源：赛乐科技，民生证券研究院

Source: Mingsheng Securities, a well known Chinese research firm.

The great silver bull case – Chen Lin, December 2022



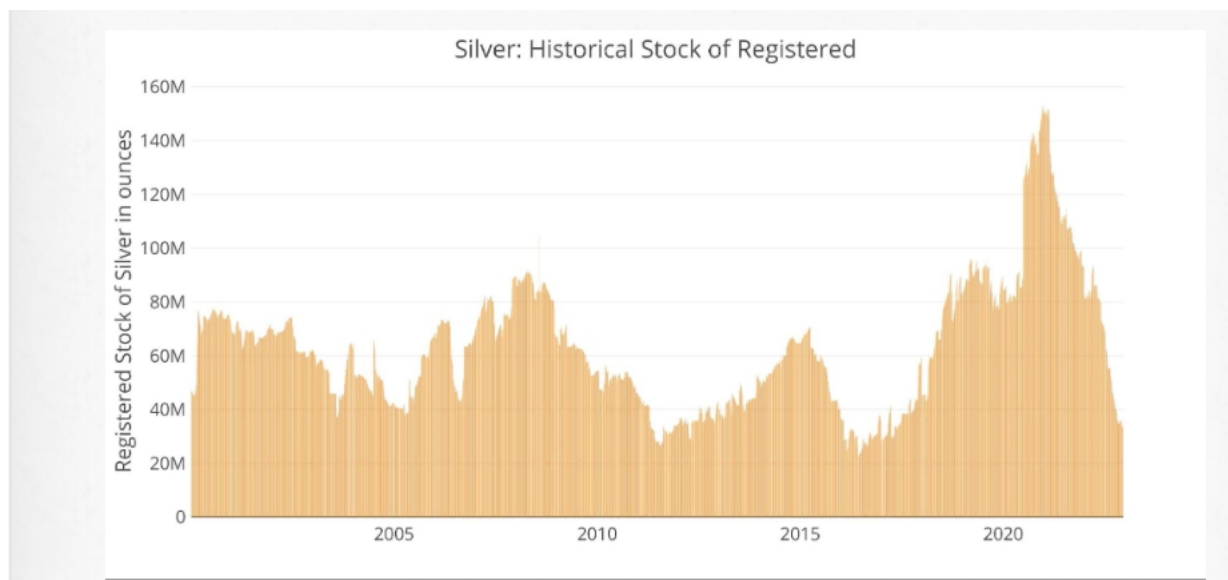
GREEN ENERGY | ELECTREK GREEN ENERGY BRIEF  
EGB | SOLAR POWER

## The largest landfill solar project in North America is now complete

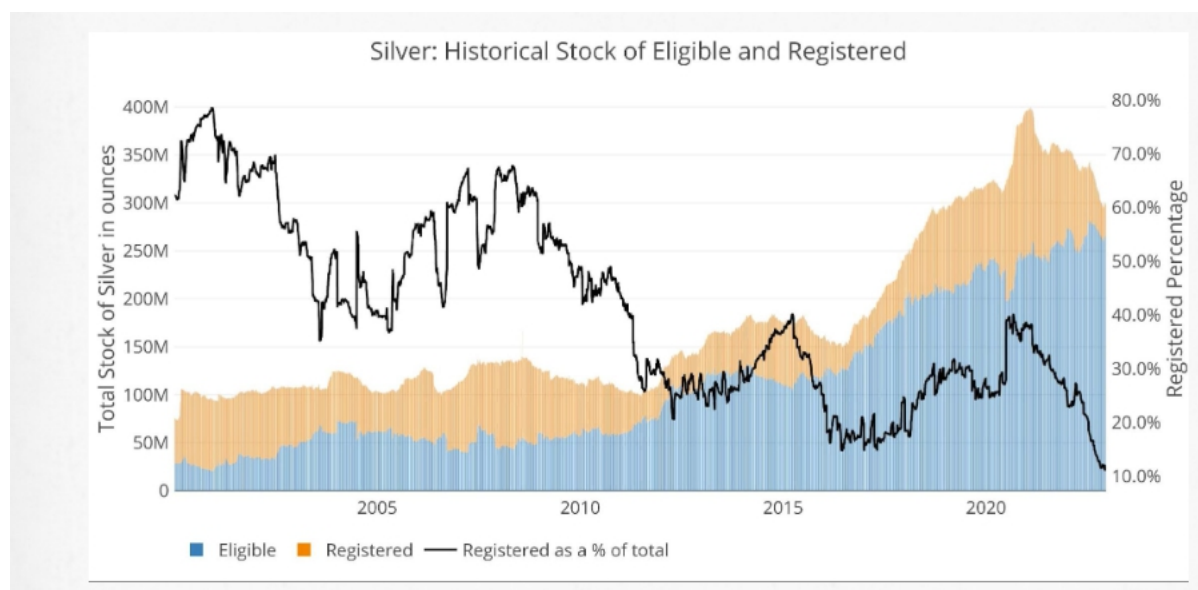
[Michelle Lewis](#) | Dec 2 2022 — 4:00 pm PT

The largest landfill solar project in North America, a 25.6 megawatt (MW) solar farm in Mount Olive, New Jersey, is online – which means yet another dumpsite has been turned into a revenue-generating, clean energy asset.

There are reports surfaced recently that the silver inventory is at historical low. This will add fuel to the fire. Record low inventory, record high demand will lead to record high silver prices for years if not decades to come.



Source: Schiffgold

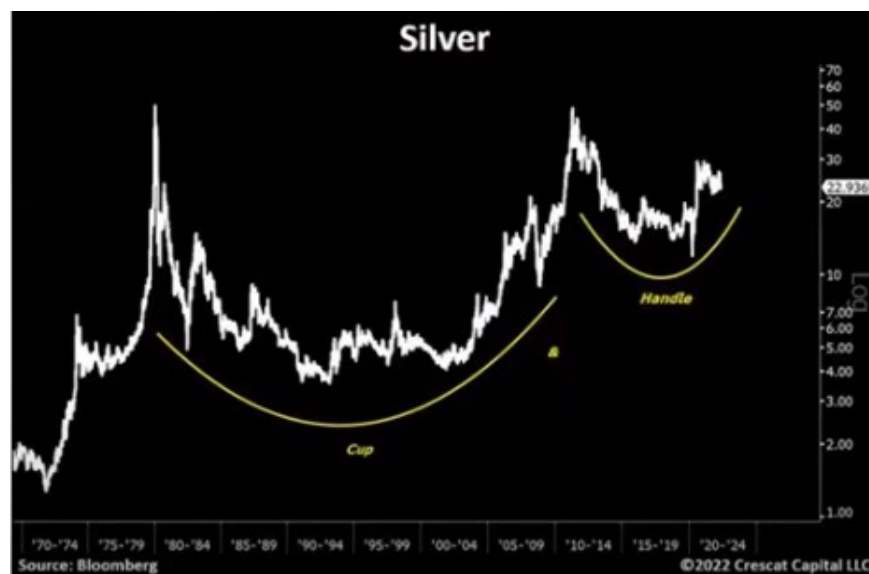


Source: Schiffgold

In conclusion, the rising silver loading factor times explosive growth of solar panel demand will create a silver tsunami of our lifetime. **Silver mine production, mostly as a by-product, has been very stable for the past decade** As we know, it takes years to explore, then years to permit and build a new mine. So it will likely take a decade to bring up the production even as the demand explodes. Only high prices, like \$50-100/oz, will encourage ordinary people to turn in their silverware, silver coins and silver jewelry.



The attached long term chart shows where we are in history. In technical trading, there is no “triple top”. When silver takes off, the historical high of \$50/oz will be only a midpoint. Triple digit price in silver is likely in the coming years.



Source: Bloomberg and Crescat LLC

Reference:

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