

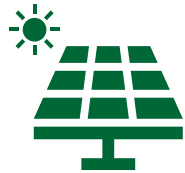


GraphEnergyTech

Unleashing the power of graphene for solar cells



Solar photovoltaics dominates new electricity generation capacity, but is dependent on silver as an electrode



Solar panels consume over 15% of the world's silver production today



85-113% of current silver reserves will be consumed by the solar industry by 2050



Silver accounts for 10% of solar module costs

An alternative low-cost electrode is urgently required

Our graphene electrodes enable low-cost photovoltaics

Highly conductive

- 10x more conductive than other commercial carbon-based inks
- Allows application to solar panels without compromising the efficiency



Low cost

- **87% Cost Reduction vs. Silver electrodes**
- For a 10GW factory: \$155M savings/yr



More environmentally friendly

- **97% Reduction in Carbon Footprint vs. metal electrodes**
- Cyanide or mercury salts not required



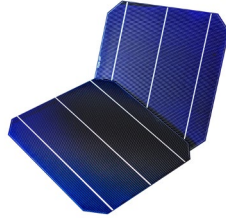
Easy to manufacture

- Low-cost screen-printing process, inkjet, doctor blade
- Compatible with existing production equipment in solar panel industry



Our primary target markets

Silicon solar



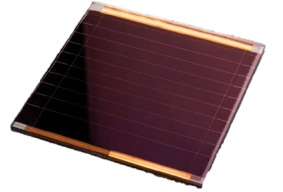
- over 500GW/year ($> 2.5\text{B m}^2/\text{year}$)
- 16.5% CAGR 2022-2032
- **Today: \$7.5B worth of silver consumption**



GET graphene provides a route to cost reduction, but reliability needs to be proven

A HORIZON project is underway on this topic with ENEL and NexWafe as development partners

Perovskite solar



- Current electrode issue prevents large scale commercialization
- \$94.8M in 2023
- **38.1% CAGR to 2032 (\$2.5B)**



GET graphene provides a route to improved reliability and commercial viability

GraphEnergyTech is engaging with its first customers on perovskite technology

- Customer 1 – Günes Perovskite Solar Cells
 - Solar farm based on new generation perovskite solar cells using our graphene electrodes
 - Planned installation and corresponding GET income:
 - 1MW in 2024 = 7'000 m² = \$ 35'000 revenue
 - 20MW in 2026 = 140'000 m² = \$ 700'000 revenue
 - 100MW in 2027 = 700'000 m² = \$ 3.5 mio revenue
 - Günes have put an engineer in Prof. Grätzel lab (EPFL) to evaluate our material and to integrate it in their solar panel design
- Customer 2 – Perovskia Solar SA
 - Swiss startup commercializing perovskite solar cells with carbon black electrode for indoor applications
 - Closed their seed round and are building production line for > 1mio cells a year
 - Perovskia are looking for a carbon electrode which doesn't involve a high temperature step – something we provide
 - GraphEnergyTech provided Perovskia with samples on Oct. 7th 2024, feedback is awaited within a couple of weeks
- Customer 3 – Taiwan Perovskite Solar Corp.
 - Highly efficient perovskite solar modules (30x20 cm), both rigid (glass) and flexible (plastic)
 - Startup of >30 employees
 - Taiwan Perovskite Corp. are interested to apply GraphEnergyTech's electrode in their perovskite solutions
 - We successfully applied for a grant together (bilateral call UK- Taiwan). GraphEnergyTech will receive £600,000 for the project. Start date is January 1st, 2025.
- Customer 4 – Enel (3Sun)
 - Italian silicon solar panels manufacturers
 - Gigafactory of silicon solar panels in Catania
 - Joint development project started via a HORIZON project.
- Allows the team to demonstrate manufacturing in commercial quantities within 2 years and develop our silicon grade products

MANAGEMENT TEAM: Deep expertise in graphene, photovoltaics and technology commercialisation



Dr Thomas Baumeler

CEO, Expertise in development of high-efficiency solar cells

- PhD from laboratory of photonics and interfaces at EPFL
- Winner of 2023 EPFL Doctorate Award
- Founded GraphEnergyTech following promising results during his PhD



Dr Nick Rimmer

Mentor and Advisor, Expertise in bringing novel materials technologies to international markets

- Over 30 years commercial and management experience with technology-based SMEs
- PhD in semiconductor physics and materials science from University of Cambridge



Dr David Martineau

Lead Scientist, Expertise in solar cells, carbon electrodes and screen printing

- PhD in chemistry working on dye-sensitized solar cells
- 12 years of experience with carbon electrodes for photovoltaics
- Commercial/startup experience



Dr Vaishakh Kedambaimoole

Senior Scientist, Expertise in graphene inks development and optimization

- Post-doc developing low sheet resistance graphene inks at the Cambridge Graphene Center
- 8 years of experience working on 2D materials



ADVISORY BOARD:

World leaders in technology commercialisation



Professor Michael Grätzel

Inventor of the dye-sensitized solar cell & #1 in worldwide composite citation index.

Excellent connections in the solar industry worldwide



Professor Andrea Ferrari

Founder and director of Cambridge Graphene Center (UCAM)

Excellent connections in the graphene industry worldwide



Neil Crabb

CEO, Frontier IP.

Investor into a wide range of technology spin-outs including Pulsiv (technology to maximise solar panel power output).

Note: Neil Crabb is a director of the company



Dr Michael Irwin

Ex CTO & co-founder CubicPV

18 years experience in solar industry. Experience in fundraising, IP, and partnership development.

Note: Michael is a director of the company

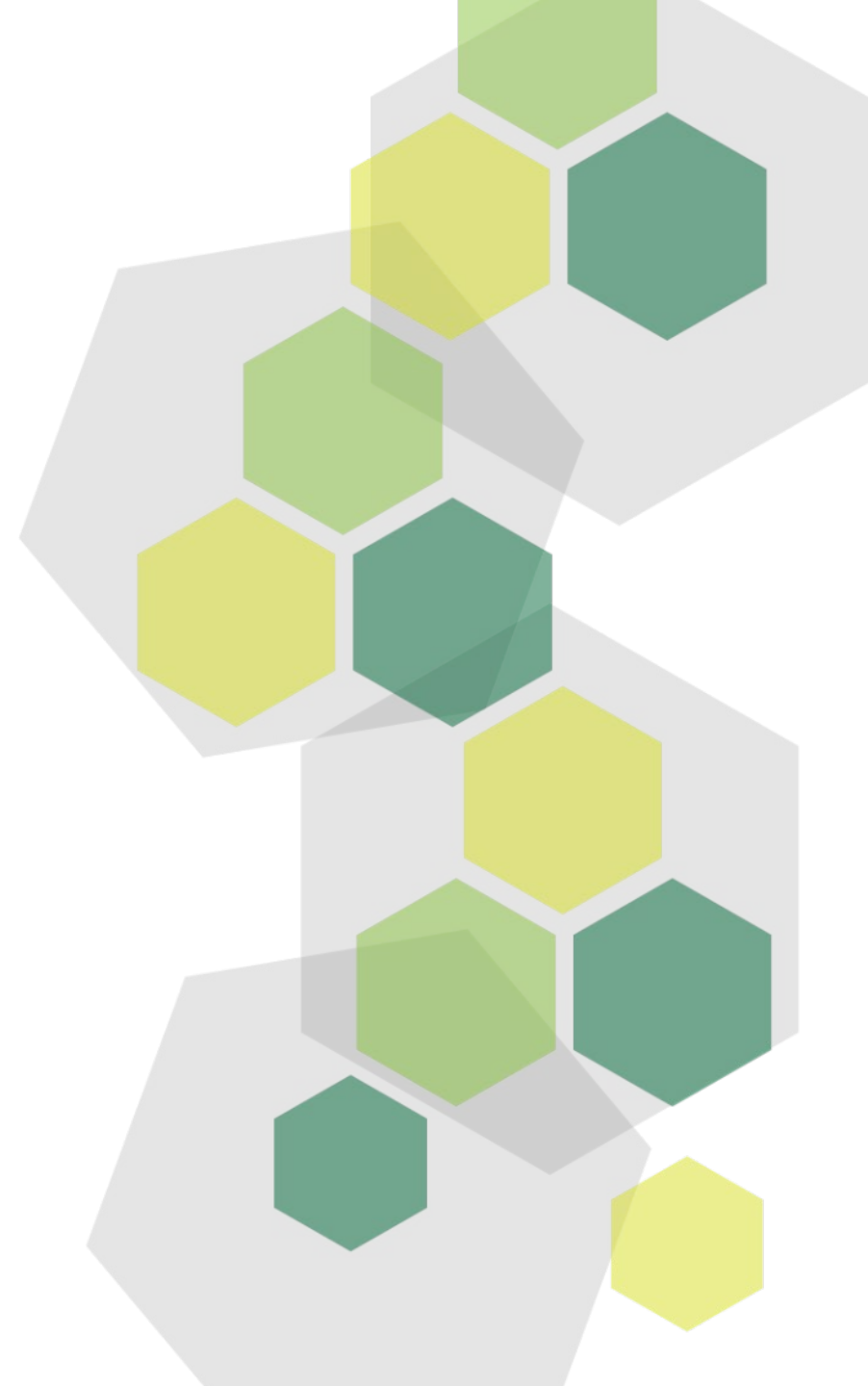
Financials

Grants and competitions:

- InnovateUK Transformative Technologies: £42.7k ✓
- HORIZON EUROPE: CHF220k ✓
- VentureKick: CHF50k ✓

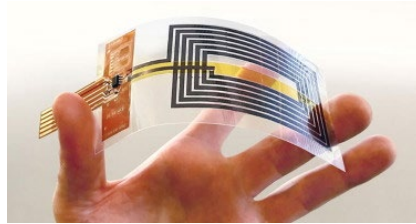
Fundraising:

- Pre-seed round: £1m (August 2024) ✓
- Next round: Seed round (£3m) planned in late 2025



Other applications targeted

Printed electronics



Supercapacitors



Batteries

Project initiated with Gachon University (Korea) and OST university of applied sciences



LEDs, displays

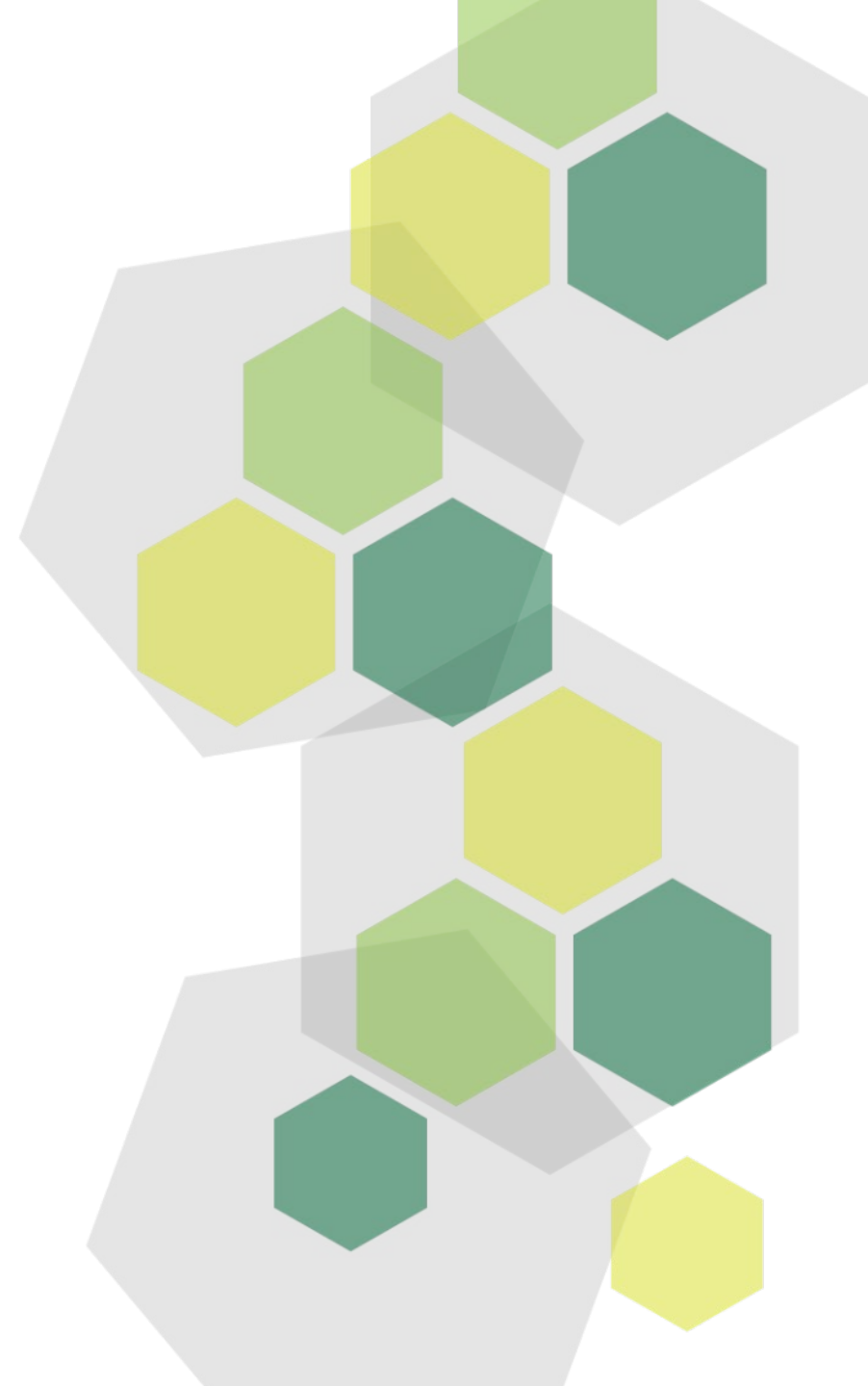


www.graphenergytech.com

Thank you for your attention !



Innovate
UK



Appendices



GraphEnergyTech save cost and CO₂



Single PV cell:

- Silver electrodes **5.4 ¢**
- **Graphene electrodes < 1¢**



87% Cost Reduction



97% Carbon Footprint Reduction



10 GW Panel Factory:

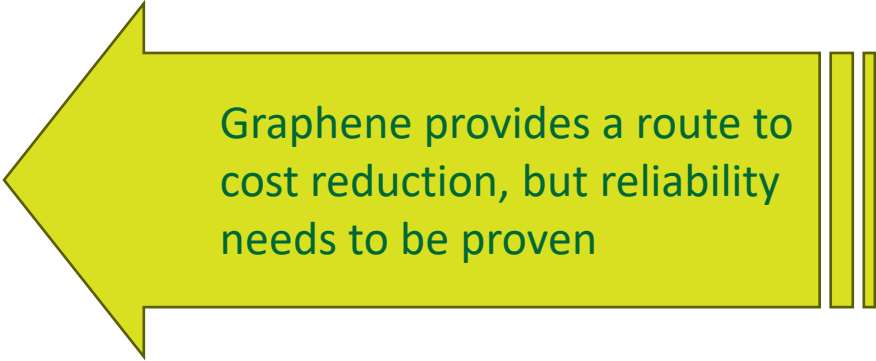
- Annual silver cost: **\$180M**
 - **Reduces to < \$25M with GraphEnergyTech**
- Environmental impact of silver **290 000 Tonnes CO₂ equivalent**
 - **Reduces to < 8500 tonnes with GraphEnergyTech**



Why would a solar manufacturer buy from us?

- **For silicon – it's about the cost**

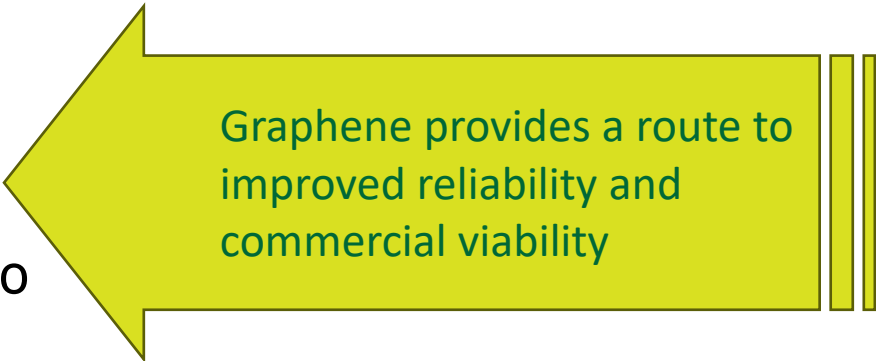
- Today: Silver accounts for 10-15%, likely to increase
- Tomorrow: Graphene will be a cheaper solution
 - For a 100MW installation: £1.5M saving in materials costs
 - For a 1GW factory: \$15M savings/yr



Graphene provides a route to cost reduction, but reliability needs to be proven

- **For perovskite – it's an enabling technology**

- Current perovskite solar cells use gold:
 - Not commercially viable
 - Reliability issues
- Our technology is proven at the cell level, ready to scale to panel level




Graphene provides a route to improved reliability and commercial viability



Why do we want to sell into these markets?

- **For silicon – it's about the volume**

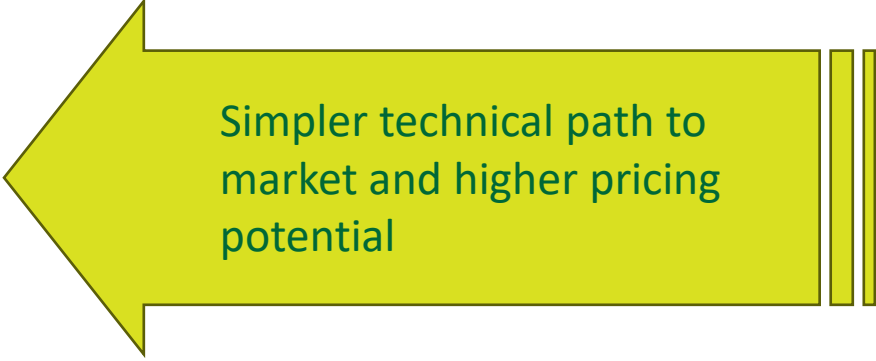
- Market is over 500GW/year
- Over 1B square meters of panels
- **Over \$7.5B worth of silver consumption**
 - (This sets the upper limit on our revenue generation!)



We need to demonstrate the compatibility of our graphene electrode with all types of silicon solar panel

- **For perovskite – it's about a fast start and profitability**

- We have technology expertise that can enable this next generation solar technology to come to market
- Higher cost tolerance for our graphene electrodes



Simpler technical path to market and higher pricing potential



SiLEAN to develop silicon panels with low environmental footprint

Horizon
Europe



- GraphEnergyTech is part of SiLEAN consortium to HORIZON-CL5-2023-D3-02 call on sustainable, secure and competitive energy supply (in collaboration with IMEC, TU Delft, FZ Juelich, 3Sun (Enel), Nexwafe & PV Works B.V.)
 - Commercial scale Silicon solar panels with Low Environmental footprint
 - Ag-free modules via screen-printing of graphene contacts (fingers & wires) using GraphEnergyTech's technology
 - Total grant requested: €3,225,846.25
 - GraphEnergyTech's budget: CHF220,000
 - **Project kicked-off in June 2024**



Financials - Overview

Summary P&L	CHF				
	Year 1	Year 2	Year 3	Year 4	Year 5
Ink Revenue	27,972	111,888	1,253,146	8,592,998	13,175,931
Royalty Revenue	-	-	521,640	4,759,020	9,322,383
Total Revenues	27,972	111,888	1,774,786	13,352,018	22,498,314
Cost of Sales	28,739	147,011	1,044,546	5,497,119	8,487,857
Gross Profit	(767)	(35,123)	730,239	7,854,900	14,010,457
Gross Margin (%)	-3%	-31%	41%	59%	62%
Total Overheads	928,918	1,240,934	1,897,766	2,148,593	2,153,588
Operating profit	(929,684)	(1,276,057)	(1,167,527)	5,706,306	11,856,869

Capital Equipment Investments			
	Item(s)	USD (\$)	CHF
Year 1	1x R&D Scale Homogeniser Analytical Equipment	150,000	133,000
Year 2	4x R&D Scale Homogenisers Analytical Equipment 2x Production Scale Homogenisers QC Equipment	1,500,000	1,330,000
Year 3	16x Production Scale Homogenisers QC Equipment	8,000,000	7,103,000
Year 4	18x Production Scale Homogenisers QC Equipment	9,000,000	7,990,000

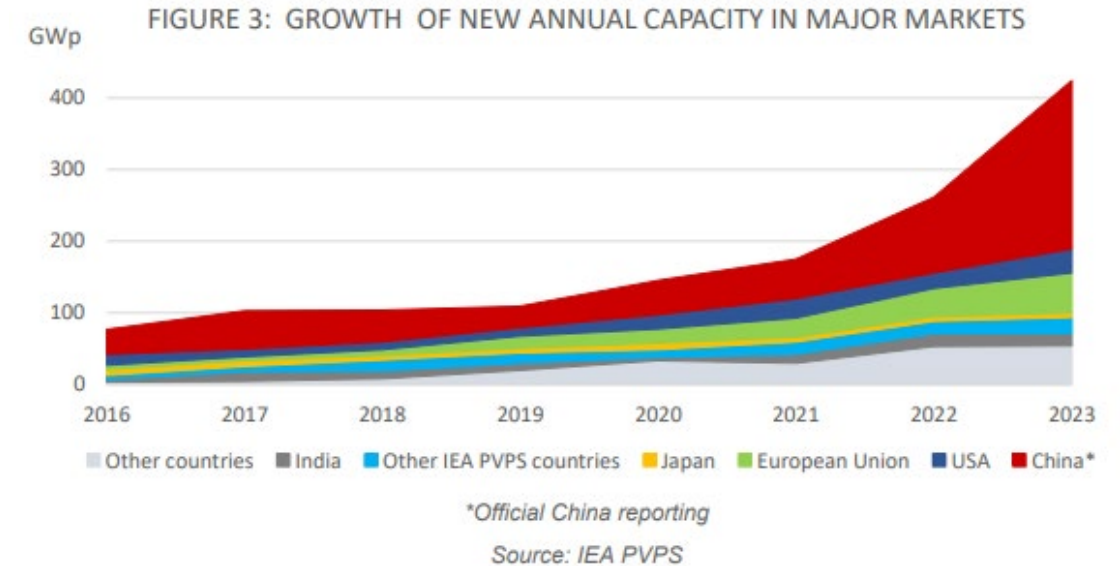
Major sources of cash expenditures for the coming year :

- Employment & external services: CHF370'359
- R&D projects: CHF235'156
- Facilities & equipment: CHF120'686

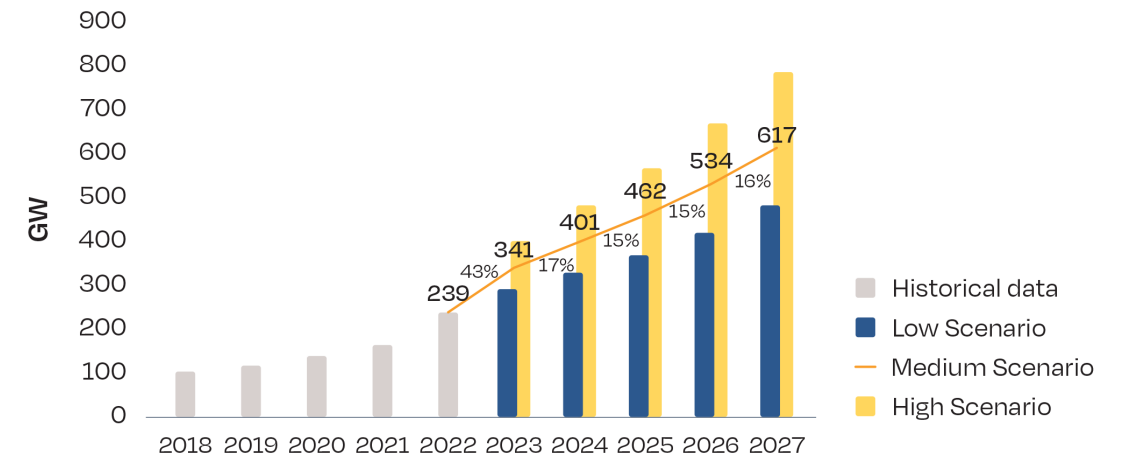


Market Potential

- IEA reported over 400GW of solar capacity installed in 2023
- Forecasts predict continued growth in the sector with long-term growth rates ~15%/year



WORLD ANNUAL SOLAR PV MARKET SCENARIOS 2023 - 2027



Market Drivers:

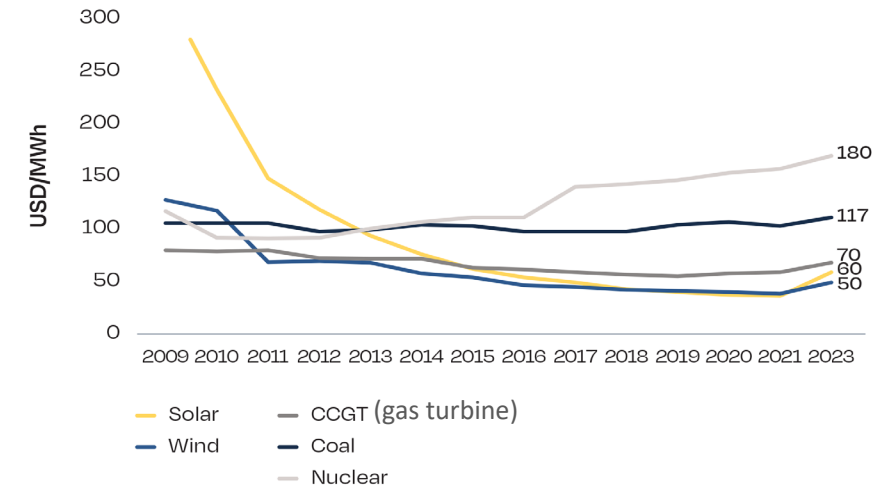
Cost

- Solar and wind are competing for the lowest levelized cost of energy (LCOE)
- 2023 data shows up-tick in LCOE due to increases in raw materials costs

Silver Availability

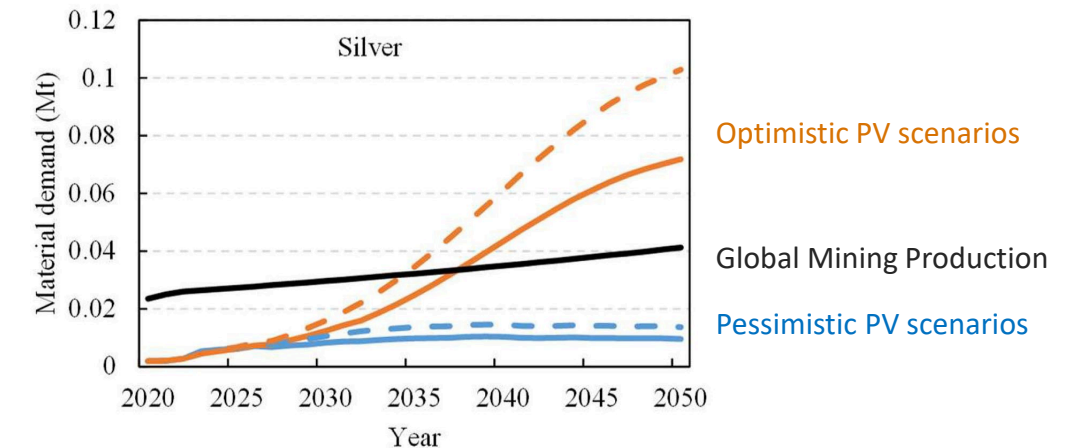
- Estimates of silver usage in the PV industry predict that demand will exceed supply before 2050

SOLAR ELECTRICITY GENERATION COST IN COMPARISON WITH OTHER POWER SOURCES 2009-2023



SOURCE: Lazard (2023). Historical mean unsubsidised LCOE values (nominal terms, post-tax).

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Source: Delft University of Science and Technology, "Future material demand for global silicon-based PV modules under net-zero emissions target until 2050" published in Resources, Conservation and Recycling, Nov 2024.

<https://www.sciencedirect.com/science/article/pii/S0921344924004178>

