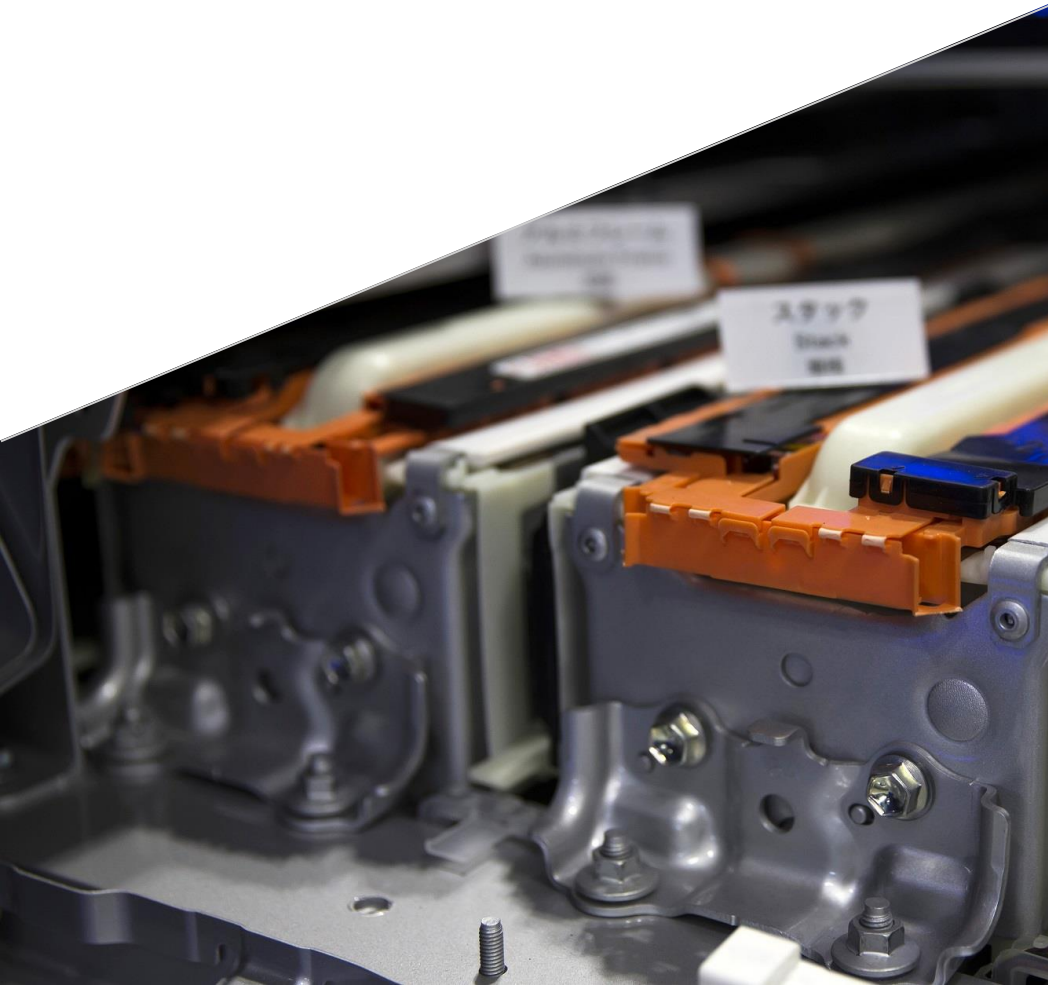


2024 Lithium-Ion Battery Price Survey

December 10, 2024



BloombergNEF

Contents

Section 1.	Executive summary	1
Section 2.	Results	3
	2.1. Volume-weighted average	3
Section 3.	The market	6
	3.1. 2024 dynamics	6
	3.2. Chemistry choice	11
	3.3. Regional dynamics	15
	3.4. Sector dynamics	17
Section 4.	Raw material and component prices	21
	4.1. Commodity prices and expectations	21
	4.2. Contract structures	23
	4.3. Impact on battery prices	25
	4.4. Other components	26
Section 5.	Outlook	28
	5.1. Near-term outlook	28
	5.2. Long-term outlook	31
	5.3. Additional scenarios	34
	5.4. Price trends this decade	35
Section 6.	Public statements and roadmaps	40
Section 7.	Additional costs	44
	7.1. Tariffs	44
	7.2. Transport costs	45
Appendix A.	Methodology	47
Appendix B.	Glossary and index information	50
About us		51

Section 1. Executive summary

\$115/kWh

BloombergNEF's 2024 volume-weighted average lithium-ion battery pack price

-20%

Change in pack prices compared to 2023

18%

Latest observed learning rate for lithium-ion batteries

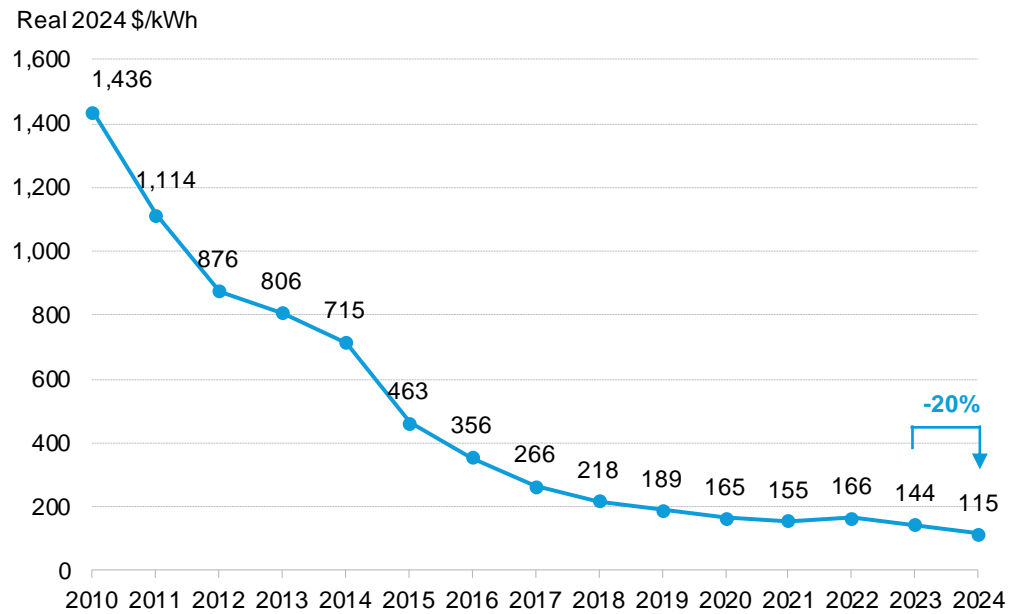
BloombergNEF's annual battery price survey has found that the volume-weighted average price for lithium-ion battery packs was \$115 per kilowatt-hour (kWh) this year. This is a 20% drop year-on-year, the biggest since 2017. Cell manufacturing overcapacity, economies of scale, low metal and component prices and the ongoing shift to lower-cost lithium iron phosphate (LFP) batteries have all contributed to this drop. This year's price survey includes 343 data points from passenger electric vehicles, e-buses, commercial electric vehicles, two- and three-wheelers, and stationary storage.

- 2024 price dynamics:** Battery pack prices fell by 20%, while cells dropped by 30% to \$78/kWh. The drop is partly due to significant overcapacity, with battery manufacturers offering very low prices to beat competition and gain market share. Battery manufacturers have aggressively expanded production capacity in anticipation of surging demand, but EV sales, one of the biggest demand drivers for batteries, have grown at slower pace than some expected. This year we recorded the lowest pack price to date, at \$45/kWh, in China for an energy storage system.
- Price outlook:** Metal prices may well rise in the next three years, as geopolitical tensions, tariffs on battery metals and low prices stalling new projects could disrupt supply and demand dynamics. Additionally, tariffs on finished battery products may lead to distortionary pricing dynamics and slow end-product demand. However, higher adoption of lithium iron phosphate (LFP), continued market competition, improvements in technology, material processing and manufacturing will exert downward pressure on battery prices. BNEF expects pack prices to decrease by \$3/kWh in 2025. For our long-term outlook, lower pack prices this year have led us to adjust our estimated learning rate to 18%, up from 17% last year. This implies a quicker drop in battery pack prices in future.
- Passenger electric vehicles:** Battery electric vehicles (BEVs) continue to have the lowest pack prices in the passenger EV segment, at \$97/kWh, a 27% decrease on 2023 prices, passing below the \$100/kWh mark for the first time. At the cell level, average BEV prices were \$73/kWh, representing 75% of the total pack price. Pack prices for plug-in hybrid electric vehicles (PHEVs) were \$320/kWh, 230% higher than BEV pack prices.
- E-buses and commercial vehicles:** Batteries used in e-buses and commercial vehicles are priced very differently in China compared to the rest of the world. In China, the volume-weighted average pack price came in at \$90/kWh, less than half the average for outside China which was \$190/kWh. The difference is down to the chemistry choice, order volumes and pack design. China is still the largest e-bus and commercial EV market and is about 61% and 60% of global battery demand in 2024 for the two sectors, respectively.
- Stationary storage:** The volume-weighted average rack price for stationary storage systems in 2024 was \$125/kWh, 19% lower than in 2023. The sector saw aggressive cost reductions, driven in large part by intense competition in China, massive oversupply of battery cells, and increasing adoption of low-cost LFP. Additionally, the movement to larger cell and system sizes has driven costs down.
- Reaching \$100/kWh:** Average battery prices for fully electric vehicles are now below \$100/kWh, an oft-cited rule of thumb for where EVs reach price parity with internal combustion engine vehicles (ICEs). In some segments, EVs have indeed reached price parity

but this varies by region, vehicle segment and automaker. EVs are still significantly more expensive than comparable combustion cars in many markets. We expect more segments to reach price parity, as lower-cost batteries become more widely available outside of China.

- This year we observe an 18% learning rate on the experience curve, one point higher compared to last year. This means for every cumulative doubling of lithium-ion battery packs deployed, prices have come down by 18%.

Figure 1: Lithium-ion battery price survey results: volume-weighted average pack prices, all sectors



Source: BloombergNEF. Note: Historical data has been adjusted to real 2024 dollars. kWh = kilowatt-hour.

About us

Contact details

Client enquiries:

- Bloomberg Terminal: press [<Help>](#) key twice
- Email: support.bnef@bloomberg.net

Evelina Stoikou	Senior Associate, Energy Storage	estoikou@bloomberg.net
Yayoi Sekine	Head, Energy Storage	ysekine4@bloomberg.net
Kwasi Ampofo	Head, Metals and Mining	kampofo1@bloomberg.net
Colin McKerracker	Head, Advanced Transport	cmckerracher@bloomberg.net
Aleksandra O'Donovan	Head, Electric Vehicles	arybczynska@bloomberg.net
Jiayan Shi	Associate, Energy Storage	jshi295@bloomberg.net

Copyright

© Bloomberg Finance L.P. 2024. This publication is the copyright of Bloomberg Finance L.P. in connection with BloombergNEF. No portion of this document may be photocopied, reproduced, scanned into an electronic system or transmitted, forwarded or distributed in any way without prior consent of BloombergNEF.

Disclaimer

The BloombergNEF ("BNEF"), service/information is derived from selected public sources. Bloomberg Finance L.P. and its affiliates, in providing the service/information, believe that the information it uses comes from reliable sources, but do not guarantee the accuracy or completeness of this information, which is subject to change without notice, and nothing in this document shall be construed as such a guarantee. The statements in this service/document reflect the current judgment of the authors of the relevant articles or features, and do not necessarily reflect the opinion of Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates ("Bloomberg"). Bloomberg disclaims any liability arising from use of this document, its contents and/or this service. Nothing herein shall constitute or be construed as an offering of financial instruments or as investment advice or recommendations by Bloomberg of an investment or other strategy (e.g., whether or not to "buy", "sell", or "hold" an investment). The information available through this service is not based on consideration of a subscriber's individual circumstances and should not be considered as information sufficient upon which to base an investment decision. You should determine on your own whether you agree with the content. This service should not be construed as tax or accounting advice or as a service designed to facilitate any subscriber's compliance with its tax, accounting or other legal obligations. Employees involved in this service may hold positions in the companies mentioned in the services/information.

The data included in these materials are for illustrative purposes only. The BLOOMBERG TERMINAL service and Bloomberg data products (the "Services") are owned and distributed by Bloomberg Finance L.P. ("BFLP") except (i) in Argentina, Australia and certain jurisdictions in the Pacific islands, Bermuda, China, India, Japan, Korea and New Zealand, where Bloomberg L.P. and its subsidiaries ("BLP") distribute these products, and (ii) in Singapore and the jurisdictions serviced by Bloomberg's Singapore office, where a subsidiary of BFLP distributes these products. BLP provides BFLP and its subsidiaries with global marketing and operational support and service. Certain features, functions, products and services are available only to sophisticated investors and only where permitted. BFLP, BLP and their affiliates do not guarantee the accuracy of prices or other information in the Services. Nothing in the Services shall constitute or be construed as an offering of financial instruments by BFLP, BLP or their affiliates, or as investment advice or recommendations by BFLP, BLP or their affiliates of an investment strategy or whether or not to "buy", "sell" or "hold" an investment. Information available via the Services should not be considered as information sufficient upon which to base

an investment decision. The following are trademarks and service marks of BFLP, a Delaware limited partnership, or its subsidiaries: BLOOMBERG, BLOOMBERG ANYWHERE, BLOOMBERG MARKETS, BLOOMBERG NEWS, BLOOMBERG PROFESSIONAL, BLOOMBERG TERMINAL and BLOOMBERG.COM. Absence of any trademark or service mark from this list does not waive Bloomberg's intellectual property rights in that name, mark or logo. All rights reserved. © 2024 Bloomberg.