

Battery Raw Materials long-term forecasts



Methodology and price
specifications – June 2023

Mission statement

Fastmarkets Metals and Mining is the leading global provider of pricing intelligence for the non-ferrous metal, steel, steelmaking raw materials, industrial minerals, ferrous and non-ferrous scrap markets, producing price assessments with Fastmarkets MB and Fastmarkets AMM since 1913 and 1882 respectively. The research arm of Fastmarkets Metals and Mining provides forecasts and analysis based on price assessments from Fastmarkets MB and Fastmarkets AMM. Established in 1991, we have provided regular, insightful analysis and forecasts to businesses around the world to help them make informed and strategic decisions and recommendations. Our mission is to meet the market's data requirements honestly and independently, acting with integrity and care to ensure that the trust and confidence placed in the reliability of our methodologies is maintained. We do not have a vested interest in the markets on which we report. Within the research function of Fastmarkets, we stress our ability to operate independently of the rest of the Group, and the existence of formal rules of confidentiality that exist between the pricing and news providers within the Group and the research and consulting functions.

Introduction

Fastmarkets' reporters and analysts are required to abide by a code of conduct and clear pricing procedures during their market reporting and pricing activities. Fastmarkets is completely independent and has no vested commercial interest in any of the markets it prices. We are the world's largest dedicated price reporting teams for both metals and forest products. We have offices in London, New York, Boston, San Francisco, Eugene, Charlottesville, Atlanta, Pittsburgh, Beijing, Shanghai, Hong Kong, Singapore, Melbourne, Sao Paulo, Mumbai, Brussels, Helsinki, Dnipro and Istanbul. The aim of this document is to provide a clear overview of Fastmarkets' forecasting methodology and specifications for the prices forecast. If you have any questions, please contact Fastmarkets Executive VP Analytics Dan Klein at dan.klein@fastmarkets.com for metals, Head of Research, Battery Raw Materials and Base Metals, Will Adams, at will.adams@fastmarkets.com about our forecast products.

Fastmarkets' forecasting methodology

Fastmarkets provides a dynamic, bottom-up and unbiased approach to long-term (>5-year) market and price forecasting.

The methodological model takes a three-way approach to account for:

1. Supply-demand fundamentals
2. Underlying costs & implied margins
3. Market sentiment

This framework enables the analysts to determine key changing drivers of price movements in the past and future.

We create a detailed market model of supply and demand. Demand is broken down into existing and new projects, while supply is broken down by industry sector, with differential growth rates and, for the electric vehicle (EV) market itself, by battery chemistry and powertrain. Clients have full access to the data sets. To source the information to prepare our price forecasts, forecasters conduct both extensive desk-based research as well as primary research; the latter being more heavily weighted toward our near-term (<3 month) view.

Fastmarkets' forecasting methodology includes drawing on expertise from our in-house analysts with forecasting experience of up to 20-25 years who rely heavily on the intelligence gathering and data analytics insight of our extensive editorial teams.

We supplement this valuable network with our proprietary databases, which focus on the underlying physical market movements that drive prices and the archive of spreads between price series that instruct and contextualize our understanding of margins.

These are supported by exhaustive third-party data and economic forecasting services, which help us to build the fundamental drivers of the future.

Our analysts have extensive existing relationships across the industry through face time and written interviews and take into account the opinions provided to our price reporters and data analytics team. This cross-referencing approach helps us to value the intelligence, generate insight and illuminate the markets.

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Modelling Fastmarkets' forecasts

Generating our forecasts is an involved process that combines macroeconomic theory, market insight, statistical modelling and machine learning. It is this combination of expert knowledge and cutting-edge data modelling that generates our trusted forecasts.

They also allow deeper insight into the fundamental workings of a market and elicit data patterns that give insight and relative weighting of key market factors that drive price direction, such as the Chinese Purchasing Manager's Index.

These insights and their statistical robustness allow our expert analysts to improve forecast accuracy and reliability and to inform their commentary along with traditional macroeconomic and sentiment analysis.

Our data collection and process:

- Includes price benchmarks - which refer to prices used in contracts - and prices that are viewed as trendsetters for a particular region or a product group
- Bespoke approach to each price forecast
- Draws on a comprehensive set of macroeconomic data
- Machine learning approach to find the best model candidate and predictions with rigorous checks on model approach and output
- Models undergo periodical review
- Rigorous approval process

Battery Raw Materials price forecasts

Crucial to the results of Battery Raw Materials price forecasts is a detailed analysis of distinct product-specific factors:

- Fastmarkets' internal forecasts for battery raw material production and consumption in individual countries or regions, considering yield losses and allowing for disruption allowances.
- Comprehensive identification and assessment of projects. Metrics, such as deposit type, stage of development, funding, geography and ownership evaluated to determine the likelihood of successful implementation.
- Estimated inventory levels in the supply chain and the need to build working stock given the growth in the sector.
- Proprietary assumptions on qualification periods for battery grade products before they can be utilized in the EV Li-ion battery value chain, based on primary intelligence gathered from market participants.
- Projected demand from battery raw materials users, such as EVs, and other battery-powered mobility, energy storage, consumer electronics manufacturers and industrial users.

- In particular, demand from battery electric vehicles (BEVs) is granularly broken down by battery chemistry and pack size, considering regional variations.
- Fastmarkets' expertise in the raw materials sector that enables an examination of production
- Costs and operating margins to determine where the price pressure points are.
- Market sentiment, including price trends of benchmark feedstock prices

Forecast list

MB-LI-0029 **Lithium carbonate 99.5% Li₂CO₃ min, battery grade, spot prices cif China, Japan & Korea, \$/kg**

Quality: Powder, accepted by buyer for use in battery applications and with the chemical composition: Li₂CO₃ 99.5% min (Min. 99.2% Li₂CO₃ accepted if it can be normalized to 99.5%); Na 0.060% max; Ca 0.016% max; Mg 0.008% max; magnetic impurities 300ppb max

Quantity: Min 5 tonnes

Location: cif main Chinese Japanese & South Korean ports (other ports normalized)

Timing: 60 days

Unit: US\$ per kg

Publication: Daily, 4pm London time

MB-LI-0033 **Lithium hydroxide monohydrate LiOH.H₂O, 56.5% LiOH min,, battery grade, spot price cif China, Japan & Korea, \$/kg**

Quantity: Min 5 tonnes

Quality: Powder, accepted by buyer for use in battery applications and with the chemical composition LiOH 56.5% min; CO₂ <0.35%; Ca 0.020% max; SO₄ 0.015% max; Cl⁻ 0.005% max

Location: cif main Chinese Japanese & South Korean ports (other ports normalized)

Timing: 60 days

Unit: US\$ per kg

Publication: Daily, 4pm London time

MB-LI-0012 **Spodumene min 6% Li₂O min, cif China, \$/tonne**

Quality: A mineral concentrate accepted by buyers for conversion in lithium chemicals used in battery applications (any size will be accepted) and with the following chemical composition: Li₂O 6% (min 5.7 Li₂O and max 6.1% Li₂O accepted if it can be normalized to 6%); Fe₂O₃ < 1.3% (max 1.5% Fe₂O₃ accepted if it can be normalized to < 1.3%), H₂O <10%

Quantity: 1,000 tonnes

Location: cif China

Timing: 90 days

Unit: US\$ per tonne

Publication: Fortnightly, Thursday, 3-4pm London time

MB-CO-0005 **Cobalt standard grade, in-whs Rotterdam, \$/lb**

Quality: Min 99.8% cobalt metal; standard specifications of the following brands in original packaging: Katanga cathodes, Chambishi broken cathodes, CTT broken cathodes, Minara briquettes, Ambatovy briquettes, Norilsk grade 1 and grade 2 cut cathodes (production since January 2019)

Quantity: Minimum 1 tonne, maximum 100 tonnes

Location: in-warehouse Rotterdam

Timing: Within 30 days, other terms normalized

Unit: US\$ per lb

Payment terms: Cash; other terms normalized

Publication: Daily, 3pm London time

MB-CO-0021 Cobalt hydroxide payable indicator, min 30% Co, cif China, % payable of Fastmarkets' standard-grade cobalt price (lowend)

Quality: Units produced from large-scale mining activity, with the following chemical composition: Co 30% min, Mn 6.5% max, Mg 6.5% max, S 5% max; Cd 100ppm max; limited concentration of natural radioactivity: GB20664-2006 (suitable for customs clearance into China).

Quantity: Min 50 tonnes (cobalt content)

Location: cif China (other terms normalized)

Timing: 45 days

Unit: % payable of Fastmarkets' standardgrade cobalt price (low end, \$/lb)

Payment terms: Letter of credit at sight, current and following price month ('M' and 'M+1')

Publication: Twice weekly, Wednesday and Friday, between 2pm and 3pm London time

Notes: Where the publication day falls on a public holiday in England and Wales, the assessment will not be published

MB-CO-0017 Cobalt sulfate 20.5% Co basis, exw China, yuan/tonne

Quality: Crystal; feed from cobalt ores & concentrates, cobalt intermediates, such as crude cobalt hydroxide (materials produced from cobalt scrap are excluded); chemical spec: Co: 20.5% min, Ni: 0.001% max, Cu: 0.001% max, Fe: 0.001% max, Zn: 0.001% max

Quantity: Min 1 tonne

Location: Ex-works China

Timing: Within 30 days

Unit: CNY/tonne

Payment terms: On bank acceptance (other payments normalized)

Publication: Twice weekly. Wednesday and Friday, between 2pm and 3pm London time

Notes: Where the publication day falls on a public holiday in England and Wales, the assessment will not be published

XL-NI-FRC.O LME nickel cash official price, \$/tonne

Quality: LME specifications: Primary Ni 99.80% min purity conforming to ASTM B39-79 (2018) or GB/T 6516-2010 - Ni9990 grade

Quantity: 6 tonnes lot size

Unit: USD/tonne

Publication: LME official settlement: 12.30-1.25pm London time

XL-CA-FRC.O LME copper cash official price, \$/tonne

Quality: LME specifications: Grade A cathode 99.9935% min Cu conforming to BS EN 1978:1998 - Cu-CATH-1, GB/T 467-2010 - Cu-CATH-1 or ASTM B115-10 - cathode Grade 1

Quantity: 25 tonnes lot size

Unit: USD/tonne

Publication: LME official settlement: 12.30-1.25pm London time

MB-GRA-0036 Graphite spherical 99.95% C, 15 microns, fob China, \$/tonne

Quality: 99.95% C, 15 microns, uncoated

Quantity: Min 20 tonnes

Location: fob China

Unit: US\$ per tonne

Publication: Weekly, Thursday by 4pm London time

MB-GRA-0042 Graphite flake, 94%, -100 mesh, fob China, \$/tonne

Quality: Flake 94% C, -100 Mesh

Quantity: Min 20 tonnes

Location: fob China, FCL

Unit: US\$ pertonne

Publication: Weekly, Thursday by 4pm London time

MB-GRA-0039 Graphite flake, 94%, -100 mesh, cif Europe, \$/tonne

Quality: Flake 94% C, -100 Mesh

Quantity: Min 20 tonnes

Location: cif Europe, FCL

Unit: US\$ per tonne

Publication: Weekly, Thursday by 4pm London time

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