

## Argus White Paper: **Lithium pricing at a crossroads**



### Introduction

We are witnessing unprecedented times in the lithium market. In the space of a few years, lithium has gone from being an obscure industrial mineral used principally in ceramic and glass applications, to become a vital component in the development of electric vehicles. Frequently hailed as the new gasoline, not a week goes by it seems without lithium hitting the mainstream news headlines.

Global lithium output reached approximately 52,250t Li in 2017, a jump of 27pc compared with 2016, with an average industry compound annual growth rate (CAGR) of 11.5pc in 2010-17, as demand for lithium in the production of lithium-ion batteries used in electric vehicles continues to rise.

The emergence of electrification, together with a sharp rise in the number of potential buyers in the market for lithium, has led to an increase in demand for more transparency around price, especially from the automotive original equipment manufacturers (OEMs), battery cell manufacturers and other end users.

At the same time, demand is growing for hedging instruments and financial tools to help industry participants on both sides of the supply chain manage price risk in this new complex automotive environment. Added to this, there is developing appetite in the global financial markets to gain exposure to lithium, strengthening the case for a futures contract or other financially-settled instruments.

A critical first step to establishing any secondary financial market is the creation of a published price for the underlying physical commodity. Up until now, a major barrier to the development of any financial tool for lithium has been the absence of a reliable published benchmark price with a robust methodology and compliance procedure to meet the requirements of financial institutions, large-scale OEMs and battery manufacturers.

It is against this backdrop that Argus has launched two new international price assessments to complement its existing battery material prices, and to better serve the needs of today's changing lithium industry. Argus' new prices include:

- Lithium hydroxide, 56.5%, battery grade, fob China
- Lithium carbonate, 99.5%, battery grade, cif China

In this white paper, we will seek to explain in further detail the market context behind the launch of our new price assessments, why a reliable third-party reference price for lithium is needed by the industry, and why Argus lithium prices provide the best benchmark for a new, rapidly changing energy environment.

### Lithium's journey from illiquidity

Like many other industrial mineral markets, the way lithium has been priced and sold has largely remained unchanged for decades. The majority of lithium raw materials — crude lithium carbonate from salt deposits and spodumene from hard rock mining — is sold under long-term contracts, usually between producers and end users directly.

This is largely still the reality, but a fundamental shift in the lithium market is well under way. Here, we examine some of the market forces driving this shift in the market that are supporting the need for a reliable industry benchmark.

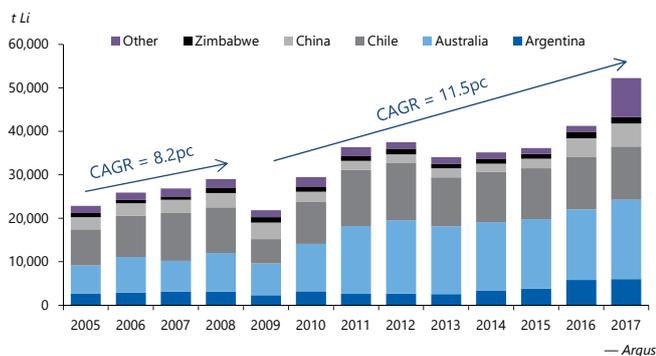
### Shift towards shorter term contracts

The global electrification push has undoubtedly had a profound effect on lithium supply. Since 2009, growth in lithium output has accelerated to almost 12 pc/yr. New production has helped to galvanise lithium supply more recently and production jumped by over 14pc to 41,250t Li in 2016 and by over 25pc to 52,250t Li in 2017. See fig 1

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The sharp rise in demand since 2000 has provided a big boost to the negotiating power of suppliers, and enabled them to reduce contract duration. Short-term transactions, defined as those for cargoes that are delivered within three months, account for a growing proportion of global lithium sales.

Figure 1: Global lithium production by country, 2005-17



### Growing pool of participants

At the same time, the traditional structure of the industry, featuring a small number of raw lithium producers and buyers, is also in transition. For many years, lithium production has been dominated by just four companies — North Carolina-based Albemarle, Philadelphia-based FMC, Chile’s Sociedad Química y Minera and China’s Tianqi Lithium.

Clearly these producers still hold a dominant position, but markets have broadened and there are now more buyers across a wide range of industries to help establish a satisfactory, acceptable price without exclusive recourse to information from producers alone.

It is also important to note that more supply from new producers is in the pipeline. Four new lithium producers will start new operations in Australia this year — Tawana Resources, AMG Advanced Metallurgical Group, Altura Mining, and Pilbara Minerals. There are well over 100 new projects in the works globally. Clearly not all will come to fruition, but we can expect more diversity in supply sources after 2020-21.

### Greater need for transparency of information

Even if there is resistance to making prices more visible from certain corners of the industry, many of the new large-scale industrial buyers, particularly automotive OEMs, require more supply chain and price transparency. This will help them to manage risk in a highly capital-intensive business as well as to meet increasing scrutiny from regulators and their own shareholders.

For car companies, managing supply chain and price risk is becoming critical as the transition to electric vehicles gathers pace. Opaque market prices for critical raw materials make it challenging to mitigate such risk, and volatile prices are a major concern.

Prices for lithium have risen sharply in the past two years alone. Lithium carbonate trade prices jumped by 43pc from around \$5,125/t in 2015 to \$7,320/t in 2016, and by a further 43pc to \$10,500/t in 2017, a more than 100pc increase over the two-year period. Lithium hydroxide trade prices jumped by 50pc from around \$7,545/t in 2015 to \$11,315/t in 2016, and by 13pc to \$12,750/t in 2017, resulting in a 69pc increase in just two years.

Average values of global lithium imports/exports						\$/t
Product	2012	2013	2014	2015	2016	2017
Lithium carbonate exports	4,683	4,839	4,576	5,100	7,199	10,356
Lithium carbonate imports	4,896	5,140	4,869	5,153	7,436	10,644
Lithium hydroxide exports	6,610	7,030	7,006	7,442	11,082	12,005
Lithium hydroxide imports	7,097	6,995	7,370	7,650	11,546	13,497

— GTIS

### Emergence of standardisation

Another major barrier to price transparency has remained the complexity of standards and classifications for lithium. Lithium is a niche product, or “specialty chemical”. For lithium as with many other minerals, there are many different grades of material, which vary depending on their source and individual chemistry.

As has been shown in other markets, standardisation is often the start of liquidity as it makes heterogenous commodities more comparable. It also enables goods to be valued more accurately. Admittedly lithium mineral products have hundreds of qualities, but a standard battery-grade lithium carbonate (Li<sub>2</sub>CO<sub>3</sub> of 99.5pc purity), and lithium hydroxide (56.5pc LiOH) — which are suitable for use in Li-ion battery precursors — has clearly emerged in recent years.

### Argus’ new lithium prices

As a response to these changing market conditions for lithium, Argus has added two new prices to existing coverage of battery raw materials prices:

- Lithium hydroxide, 56.5%, battery grade, fob China
- Lithium carbonate, 99.5%, battery grade, cif China

[For full specifications, please click here](#)

### Why has Argus chosen these prices?

As the largest electric vehicle market in the world, China is by far the biggest destination of lithium. China is not only now the world’s largest importer of lithium carbonate, it is also the largest exporter of hydroxide. Our assessments for lithium carbonate (99.5%, battery grade) on a cif China basis, and for lithium hydroxide on a fob China basis are a logical response to these market conditions.

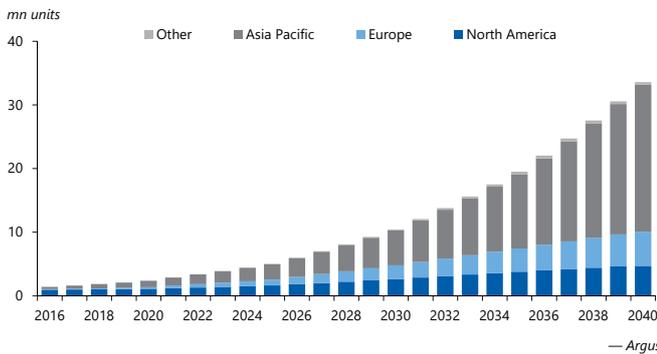
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China accounted for 26pc of global lithium carbonate imports of 117,500t in 2017, followed by South Korea with 18pc and Japan with 14pc. And China accounted for 38pc of global exports of lithium hydroxide in 2017, with shipments increasing from 3,500t in 2012 to 19,400t in 2017 — a CAGR of over 40pc.

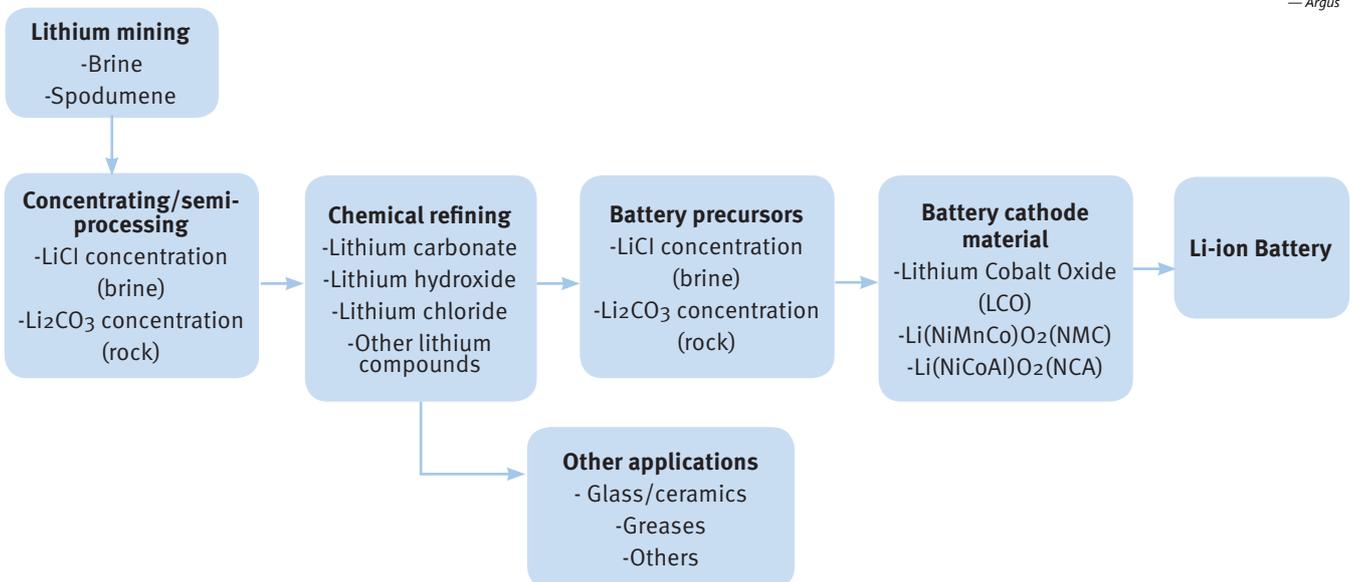
This trend is set to continue as China ramps up consumption in the next few years to meet growing demand from the domestic electric vehicle sector, supported by Chinese government policies and ambitious targets to accelerate electric vehicle development in the country.

China's domestic market is already home to the most liquid physical spot trade for lithium carbonate and lithium hydroxide. Argus has tracked these prices since January 2016. As China continues to supplement its domestic carbonate production with overseas supply, and increase exports of hydroxide, we expect a similar dynamic to emerge in global markets, with China forming the most liquid international spot reference. This in turn will provide the most accurate and liquid benchmark for all parts of the battery supply chain.

**Figure 2: Forecast global alternatively-fuelled vehicle registrations, 2016-40**



**Figure 3: Lithium supply chain**



## Industry consultation and collaboration

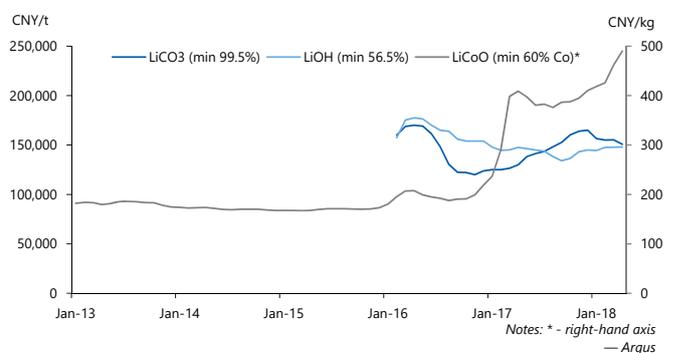
Argus has engaged with all parts of the lithium supply chain to develop the most effective and relevant prices for today's market. Over the past six months, our team of experts has consulted a broad range of industry players, on both the supply and demand side of the lithium industry. We have received input directly from raw material producers, battery cathode manufacturers, battery producers, and automotive companies. Our prices reflect direct feedback from key market participants.

## Argus' China track record

Argus lithium assessments are further supported by a strong reporting presence in China, with offices in Beijing and Shanghai, as well as regional support from our offices in Tokyo and Singapore. Our reporting team in Europe (London), and the Americas (Houston and New York) ensure that we are in contact with the lithium community worldwide.

Argus has an established track record of reporting in China. Argus has been tracking the battery chemical market since 2012. At this time, Argus began assessing prices for lithium cobalt oxide — a precursor material for batteries. In early 2016, Argus began assessing Chinese domestic lithium carbonate and hydroxide prices. The evolution of these price assessments is shown in the chart below.

**Figure 4: Chinese lithium prices, 2013-18**



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### How Argus prices lithium

Argus uses a market-appropriate methodology to assess prices in each of the markets that it covers. Because all markets are unique, Argus designs a methodology specific to the commodity, geography and timing under consideration.

Argus methodologies reflect the way markets trade, and are determined by industry conventions. We have ensured that our methodology for lithium meets the needs of the market and is in line with industry practice through direct collaboration with industry participants.

Argus price assessments are reliable indicators of commodity spot market values, free from distortion. Argus makes a distinction between open market, arms-length trade and internal transfer pricing or long-term contracts, which are not reflective of the open market and are not taken into account in assessing lithium prices.

Argus has decades of experience and a proven track record in assessing prices in illiquid markets. We take a structured approach to assessing such markets. In the first instance we seek price information relating to verified spot transactions. In the absence of physical trade we look to firm bids and offers.

Our methodology also allows reporters to take into account a range of other relevant market information, including related markets where lithium is traded at a different location and on a different basis. For example, the Argus domestic ex-works China prices may inform the assessment of fob and cif prices.

Our international price assessments are published weekly on Tuesday, with China ex-works prices published biweekly on Tuesday and Thursday. Our lithium price assessments appear in our flagship daily metals report Argus Metals International, which includes detailed market commentary, market-relevant news and analysis.

Argus price reporters make every effort to verify information they receive with the wider marketplace through bilateral meetings with key market participants, through email, and by telephone. All data captured by our market reporters are stored electronically, and regularly audited. Argus reporters are required to document the exact rationale behind each published price assessment.

All our price assessments use best practice guidelines designed to comply with the principles set out by the International Organization of Securities Commissions (Iosco) in 2012, and we engage consultancy PwC to review those policies and processes.

[To view a copy of our full methodology, please click here](#)

### Why Argus?

Argus is a specialist global commodity price reporting agency that has been covering markets for over 40 years. The company's early origins were in analysing and pricing oil and refined products markets, but coverage now extends to a wide range of commodities.

Argus assessments are used as the reference price in physical supply and derivative contracts. They are accepted as accurate and reliable indicators of the real value of commodities across many different markets including — crude, petroleum products, natural gas and LNG, petrochemicals, electricity, biomass, biofuels, fertilizers, metals and coal.

Our data are used by companies and governments around the world to index physical trade, and as benchmarks in financial markets. With such extensive experience in energy markets, and largely illiquid markets, Argus is uniquely placed to provide the effective framework for establishing prices for lithium and other future energy materials.

### Why is Argus the best source of price assessments in the lithium market?

- Argus is the only price reporting agency that reports a distinct seaborne China price for lithium, having established that China is the most, if only, liquid spot market.
- Argus has a strong on-the-ground presence in Asia-Pacific, with offices in Beijing, Shanghai, Singapore and Tokyo. Our team of reporters in the UK (London) and the Americas (Houston and New York) provide further support for assessing international lithium prices.
- Argus' lithium price assessment methodology is not a generic price assessment methodology but one that has been tailored for the specific conditions of the lithium market through direct industry consultation.
- In addition to price assessments, Argus provides extensive commentary and forward-looking monthly and annual reports for the battery raw material market.
- Argus has completed six annual external assurance reviews of its energy and petrochemical price benchmarks. Argus designed the policies and processes reviewed by PwC to comply with the principles for price reporting agencies (PRAs) set out by the International Organization of Securities Commissions (the Iosco PRA Principles) in October 2012.
- Argus has decades of experience assessing prices in illiquid markets, and a well-established customer base in the global energy and commodity markets.
- Argus is a trusted price data provider to governments and companies in over 140 countries around the world.