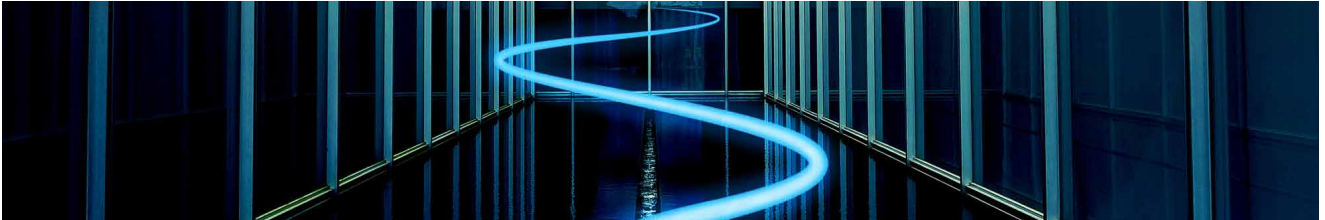


Argus Battery Materials Monthly Outlook



Outlook

The month ahead

Prices for the main battery raw materials, lithium and cobalt, have been mainly higher in January after a jump in prices towards the end of 2017. The near term outlook is for prices to remain steady to slightly up as the market looks for direction in the first quarter.

The next 3-6 months

Market fundamentals will come more into play in the next six months and it is possible that the price trends for lithium and cobalt will start to diverge. Cobalt supply remains the more concerning issue for the battery industry.

12 months forward

Demand for battery raw materials is expected to continue to forge ahead in the coming year and the direction of prices will depend on the ability of battery raw material producers to keep up.

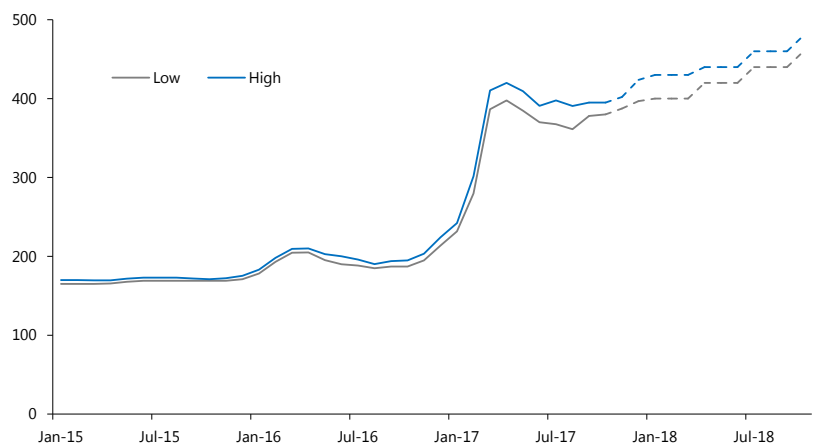
Lithium cobalt oxide

The average monthly price for lithium cobalt oxide increased by just under 4pc in December after a 1.8pc rise in November, mainly as a result of rises in the price of cobalt. Prices for lithium cobalt oxide (min 60pc Co) were assessed slightly up on the month at 410-430 yuan/kg (\$63.26-67.17/kg) on 23 January and averaged Yn396.84-423.68/kg (\$60.20-64.27/kg) for December.

OUTLOOK: Steady-strengthening

Chinese lithium cobalt oxide

Yn/kg



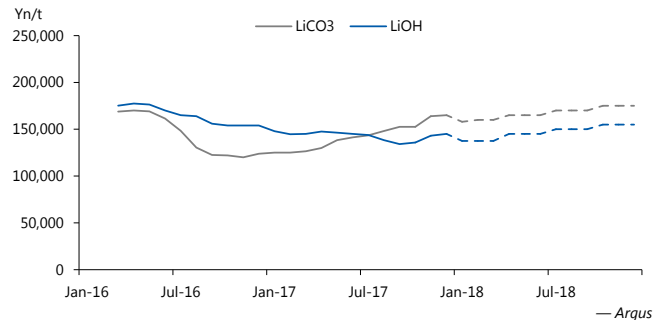
— Argus

International pricing series

Lithium

Chinese prices for lithium carbonate averaged Yn160,000-170,000/t (\$24,275-25,790/t) in December, up by 0.6pc on the previous month, while lithium hydroxide prices averaged Yn140,000-150,000/t, a rise of 1.3pc. Lithium carbonate prices were 6pc down towards the end of January, with lithium hydroxide unchanged on the month.

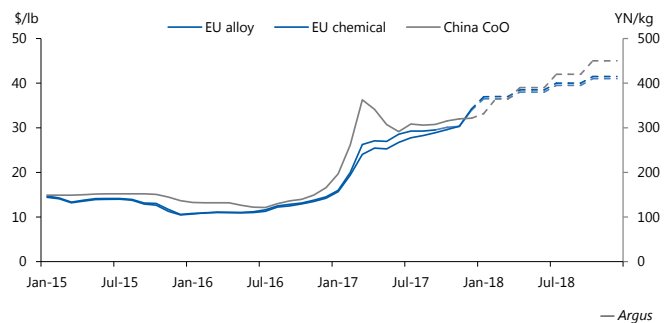
OUTLOOK: Weakening-steady



Cobalt

European prices for cobalt metal (min 99.8pc alloy grade) averaged \$33.32-34.59/lb in December, 10.7pc up on November. European prices for cobalt metal (min 99.8pc chemical grade) have overtaken alloy grade prices, averaging \$33.67-34.81/lb in December, while in China, cobalt oxide prices (72pc, ex-works) averaged Yn328.74-335.00/kg in December.

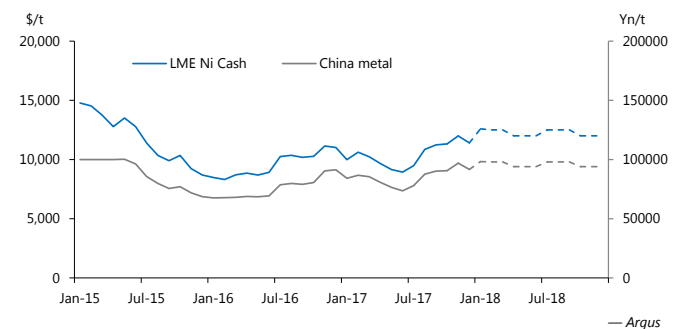
OUTLOOK: Strengthening



Nickel

In China, Argus' recently launched nickel sulphate (min 22pc ex-works) assessment averaged Yn25,000-26,500/t (\$3,905-4,140/t) in December, narrowing to Yn25,500-26,000/t at the start of January before recovering to the previous level. Official cash nickel prices on the LME averaged \$11,402.11-11,409.21/t for December, 5pc down on November, rising to \$12,590-12,595/t by late January.

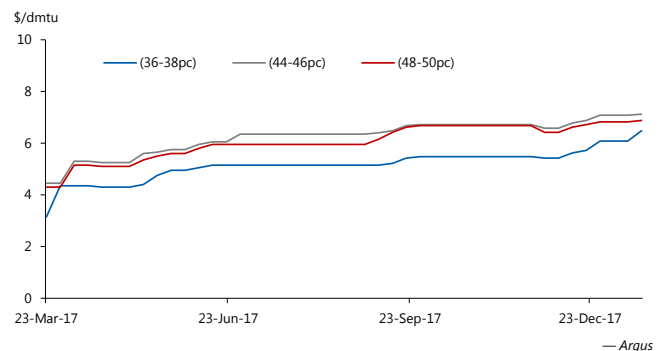
OUTLOOK: Steady



Manganese

Chinese prices for manganese ore (cif China) ranged from \$6.40-6.55/dry metric tonne unit (dmtu) and \$7.05-7.20/dmtu depending on the grade towards the end of January. December averages were \$5.64-5.79/dmtu for 36-38pc Mn grade, \$6.75-6.90/dmtu for 44-46pc Mn, and \$6.58-6.73/dmtu for 48-50pc Mn (all cif China basis).

OUTLOOK: Steady



Price outlook

- SQM cleared to expand lithium carbonate production capacity by up to 30pc in 2018; Orocobre raises planned expansion at Olaroz to 25,000 t/yr
- Glencore to more than double cobalt output to around 65,000t in 2019, up by 133pc from an estimated total of 27,000t in 2017
- China to raise electric vehicle production by 40pc in 2018 to 1mn units

Lithium

The hydroxide market continued to rise in response to a strengthening market for ternary battery material. The range for 56.5pc grade hydroxide increased to Yn145,000-150,000/t on 23 January from Yn140,000-150,000/t on 18 January, while prices for 99.5pc grade carbonate held flat at Yn150,000-160,000/t. The range for lithium cobalt oxide moved up to Yn410-430/kg on 23 January from Yn405-430/kg, as higher cobalt tetroxide prices increased production costs.

The 18 January assessment saw the hydroxide market move higher after two weeks of stability following a rise in prices for ternary materials. The range for 56.5pc hydroxide rose to Yn140,000-150,000/t, up from a previous assessment of Yn135,000-150,000/t. Prices for 99.5pc grade carbonate were assessed stable at Yn150,000-160,000/t, and the range for 60pc lithium cobalt oxide stabilised at Yn405-430/kg after rising by Yn5/kg at the low end in the previous assessment on 16 January.

On 11 January, the market turned lower as battery consumers were still operating from inventories and many traders continued to sell off stocks. The range for 99.5pc carbonate dropped by Yn5,000/t to Yn150,000-160,000/t, its lowest level since early October. Hydroxide prices held at Yn135,000-150,000/t for 56.5pc grade, with most deals concluded around Yn140,000/t.

On 4 January, the range for 99.5pc carbonate was unchanged at Yn155,000-165,000/t, with hydroxide prices holding at Yn135,000-150,000/t.

Cobalt

In Europe, sellers raised offer prices but the market was stable as buyers did not commit to purchasing material at the higher level. Prices for 99.8pc chemical grade metal were assessed unchanged from 18 January at \$37.50-38.15/lb on 23 January. The majority of business was booked in this range, with sellers offering as high as \$38.50/lb. A small sale of 1t of broken cathode for prompt delivery was reported above the range for chemical-grade material but did not reflect spot prices. Supply of chemical grade metal remains tight. Prices for 99.8pc alloy grade were assessed unchanged at \$37-38/lb on 23 January. There were few inquiries for small volumes of spot material, but traders expect to sell at higher prices towards the end of January.

On 18 January, tight supply, particularly for chemical grade metal, continued to push prices higher. Sellers increased their offer prices for alloy-grade material. Prices for 99.8pc chemical grade metal were assessed at \$37.50-38.15/lb, up from \$37-38/lb on 11 January. Prices for 99.8pc alloy grade material were assessed up by 20¢/lb on 18 January at the top end of the range to \$37-38/lb.

On 11 January, news of a suspension in Ambatovy's operations in Madagascar until at least the end of the month lifted the market. Supply of 99.8pc chemical-grade broken cathode and briquette remained tight and prices rose sharply to \$37-38/lb, up from \$36.10-37/lb previously. Buyers received few offers from producers for briquettes and broken cathode was offered up to \$37.85/lb for 2t. The range for 99.8pc alloy grade rose less sharply, to \$36.50-37.35/lb from \$35.40-36.60/lb previously, but traders increased their offer prices in response to the tighter supply of chemical grade. A deal for 6t was concluded at \$36.50/lb and a trader offered up to \$37.35/lb for 2t.

In China, a rise in international prices lifted the range for 99.8pc metal to Yn553-585/kg on 23 January from Yn552-580/kg on 18 January. Supply of Chambishi metal remained tight and traders scaled back their sales on expectations of a further rise in prices. On the salts market, prices for 24pc grade chloride moved up to Yn133,000-135,000/t on 23 January from Yn130,000-135,000/t on 18 January, and prices for 20pc sulphate increased to Yn114,000-118,000/t on 23

January from Yn112,000-117,000/t following the rise in metal prices. That in turn lifted the range for 73pc tetroxide by Yn3/kg at the low end to Yn408-430/kg.

On 18 January, the metal market held at a five-year high amid low inventories of imported material. The range for 99.8pc metal was assessed unchanged at Yn552-580/kg. Suppliers scaled back sales and expected prices to reach Yn600/kg. On the salts market, chloride prices were unchanged at Yn130,000-135,000/t and sulphate prices held at Yn112,000-117,000/t. Tetroxide prices remained in a range of Yn405-430/kg after rising from Yn390-410/kg on 16 January.

On 11 January, Prices for 99.8pc metal were assessed unchanged at Yn550-570/t as the rise in international prices slowed. The salts market held onto recent gains, with prices for sulphate stable at Yn110,000-115,000/t and the range for chloride at Yn130,000-135,000/t. Producers have mostly allocated their output to long-term orders.

Nickel

European premiums for nickel, which will next be assessed on 25 January, increased on the previous week on continued tightness in the spot market. The premium for full-plate nickel cathode in-warehouse Rotterdam increased to \$300-350/t on 18 January, up from \$280-300/t on 11 January. The premium for 4x4 cut cathode in-warehouse Rotterdam was assessed at \$420-460/t, up from \$400-420/t and the premium for nickel briquettes increased to \$340-365/t on 18 January from \$320-340/t. Spot availability in Europe remained tight compared with other regions, including the US and China. Nickel stocks on the LME fell to 364,968t on 17 January, from

365,868t on 10 January. Stocks in European warehouses fell by 1,134t to 50,742t during the period. Material was drawn at Rotterdam, Netherlands, where stocks fell to 49,950t.

Argus' new nickel sulphate quotation (basis 22pc, ex-works) started at Yn25,000.00-26,500.00/t in mid-November 2017 and finished the year unchanged. Prices at the top of the range dipped by Yn250/t to Yn25,000.00-26,000.00/t, before returning to the previous level on 23 January.

Manganese

In China, producers continued to increase prices on tight supply, lifting the range for 99.7pc grade flake to Yn12,300-12,600/t on 23 January from Yn11,900-12,200/t on 18 January. A key producer in northern China stopped offering spot material. A producer closed a deal for several hundred tonnes at Yn12,600/t paid by acceptance bill, for delivery on 10 February. Producers in southern China continued to experience power grid overloads and tight ore supply because of environmental inspections. The increase in domestic prices and weaker US dollar lifted export prices to \$1,975-2,025/t fob on 23 January from \$1,950-2,000/t fob on 18 January.

The European market moved to parity with Chinese export prices, as low spot demand in Rotterdam prevented the market from establishing a premium. Domestic consumers were reluctant to accept higher offer prices from suppliers. On 18 January, the range widened as suppliers sold stocks bought at lower prices, following recent gains. The assessment for 99.7pc flake was \$1,925-2,000/t, from \$1,950-1,990/t on 16 January. Business was concluded at the low end of the range.

Argus battery material indexes (cumulative averages)					
Element	Units	Month index December	Moving quarterly average	Moving yearly average	Forecast December 2018
Li carbonate min 99.5% ex works China	CNY/t	165,000.00	160,532.11	142,670.02	175,000.00
Li hydroxide min 56.5% ex-works China CNY/mt	CNY/t	145,000.00	141,324.96	143,057.01	155,000.00
Lithium cobalt oxide min 60% Co ex-works	CNY/kg	410.26	397.51	370.85	470.00
Cobalt min 99.8% alloy grade du Rotterdam	\$/lb	33.96	31.46	27.26	41.00
Cobalt min 99.8% chemical grade du Rotterdam	\$/lb	34.25	31.40	26.30	41.50
Co oxide 72% ex-works China	CNY/kg	321.48	318.98	303.29	450.00
LME Nickel Cash Official Price	\$/t	11,405.66	11,572.89	10,406.22	12,000.00
Ni metal min 99.9% Ni ex-warehouse China	CNY/t	91,613.16	93,037.34	85,166.38	94,000.00
Ni sulphate ni 22% ex-works China	CNY/t	25,750.00	25,685.90	n.a	26,500.00
Mn ore 36-38% Mn cif China	\$/dmtu	5.71	5.50	5.08	—
Mn ore 44-46% Mn cif China	\$/dmtu	6.83	6.74	6.18	—

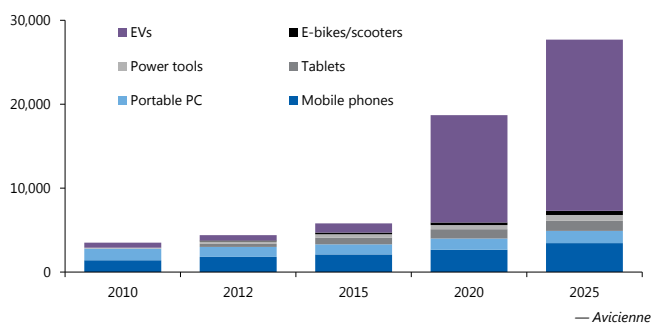
Markets

Demand for battery materials continues to grow to feed the expansion in lithium-ion battery production to power electric vehicles and battery manufacturers are expanding capacity to keep pace. Chinese lithium producer Ganfeng will invest 250mn yuan (\$38mn) to build a pilot plant in Jiangxi province to produce solid-state lithium batteries. Construction is scheduled for completion in 2019. Solid-state lithium battery technology is expected to be widely used in electric vehicles, replacing nickel-cobalt-manganese lithium-ion batteries, because of its higher stability and safety performance and lower output costs. The liquid electrolyte is replaced with a solid material in a solid-state battery, reducing its size and cost, while raising its capacity and lifespan. Ganfeng can produce 22,000 t/yr of lithium carbonate, 12,000 t/yr of lithium hydroxide and 1,500 t/yr of lithium metal. The company has produced around 12,000t of lithium carbonate and 8,000t of hydroxide this year.

Chinese electric vehicle and battery manufacturer BYD will use nickel-cobalt-manganese (NCM) lithium batteries in its new passenger car models to be released in the second quarter of 2018. BYD aims to install NCM lithium batteries in all of its passenger car models in future to replace lithium iron phosphate batteries, which will only be used in its E6 multi-purpose vehicle (MPV) and electric buses. BYD is the largest domestic supplier of plug-in electric cars in China. Its sales of electric vehicles reached 100,183 units in 2016, up by 62.3pc from 61,722 units in 2015. The company is building a new NCM lithium battery plant in Qinghai province with 10 GWh/yr of capacity, which is due to come on stream in 2019. The new plant, at a cost of Yn40bn (\$6bn), will raise BYD's total capacity of NCM lithium battery to 16 GWh/yr. BYD's total battery production capacity is expected to have reached 16 GWh/yr at the end of last year, including 10 GWh/yr of lithium iron phosphate batteries and 6 GWh/yr of NCM lithium batteries. Growing investment in the production of NCM lithium batteries will lift demand for nickel, cobalt and manganese used in the cathode materials. Chinese EV production reached 794,000 units in 2017, and a plan by the government to install more charging outlets is expected to further increase demand for electric vehicles and the batteries to power them.

Japanese electronics corporation Panasonic and carmaker Toyota are to assess the possibility of collaborating on

Forecast li-ion battery demand by sector, 2010-25mn cells



prismatic lithium-ion automotive battery development. The companies have identified prismatic batteries as a key technology for development, as well as potential work on solid-state lithium-ion cells. Prismatic batteries, used primarily in mobile phones or tablets, use a layered approach that reduces weight and thickness compared with traditional cylindrical lithium batteries. Toyota and Panasonic already work together on lithium-ion and nickel-metal hydride battery technology development through their joint venture Prime Earths EV Energy.

Toyota has been a relative latecomer to the development of lithium-ion electric vehicle batteries, having initially focused on hydrogen fuel cells. But the company has taken steps to address this, partnering with Japan's Mazda to manufacture EV technology and with Japan's Suzuki to introduce electric models to China and India. Toyota anticipates that electrified vehicles — including plug-in hybrid vehicles and fully electric models — will comprise around half of its total sales by 2030.

The Chinese government is likely to adjust its subsidy scheme for electric vehicles (EVs) in 2018 with the aim of increasing the production of longer range vehicles. The government is considering reducing the national subsidy for short-range EVs and cancelling all subsidies paid by local authorities, according to the China Passenger Car Association (CPCA). The change is expected to encourage domestic battery manufacturers to switch their production to nickel-cobalt-manganese (NCM) lithium-ion batteries, which have a higher energy capacity than lithium iron-phosphate batteries. The Chinese central government provides a subsidy of 20,000 yuan (\$3,000) for EVs with a range of less than 150km, and local

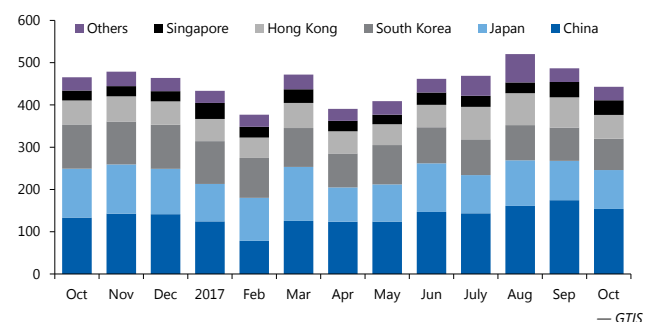
governments grant a Yn10,000 subsidy. But Beijing is likely to remove the subsidy for EVs with a range of less than 150km next year, while increasing the subsidy to Yn45,000 for EVs with a range of 300-400km. EVs with a range of more than 400km will be eligible for a Yn50,000 subsidy. The country's minister of science and technology forecast production to reach 1mn units this year in response to the government's plans to promote the use of clean energy. Chinese metal producers are planning to build new production lines for nickel-cobalt-manganese (NCM) lithium battery material, while its production capacity for intermediate battery chemical nickel sulphate is estimated to have increased by 50pc this year. Domestic lithium producers are also increasing their production of lithium salts.

China is on target to increase its production of electric and hybrid vehicles by more than 40pc to 1mn units in 2018, China's minister of science and technology Wan Gang said. The rise in the production target is in response to China's plan to promote the use of clean energy, Wan said at a recent meeting with IEA executive director Fatih Birol.

Domestic EV output was only 379,000 units in 2015 and 517,000 units in 2016.

New EU passenger vehicle registrations increased last year, with growth in four of the five large markets but a decline in the UK, data from automotive manufacturers association the ACEA show. EU passenger vehicle registrations increased by 3.4pc to 15.1mn last year from 14.6mn in 2016. But registrations fell by 4.9pc to 1.08mn year on year in December, mainly because December last year had one less working day than December 2016. Registrations increased in most EU countries last year. Registrations in Germany, the largest EU vehicle market, increased by 2.7pc to 3.44mn from 3.35mn in 2016. Italian and Spanish registrations increased by more than 7pc, and French registrations gained 4.9pc. But UK registrations fell by 5.7pc. Registrations in most eastern European countries rose by over 10pc, with the largest increase

Monthly lithium-ion battery exports, 2016-17 mn cells



in Hungary, where registrations firmed by 20.4pc to 116,265 from 96,552.

Charging infrastructure is key to raising consumer uptake of electric vehicles, and utilities are planning to install more charging stations in the coming years. For example, California's largest utility has announced plans to install 7,500 charging stations over the next three years to support the state's efforts to get more electric vehicles on the road. Pacific Gas & Electric has launched the EV Charge Network program, a \$130mn effort to install EV charging stations at condominiums, apartment buildings and workplaces across northern and central California. The utility says 500 customers have already expressed interest in the program. Some of the first charging stations will be installed at Merced College in central California.

California has a target of 1.5mn zero-emissions vehicles on its roads by 2025. There were 337,000 in California last year. The state Air Resources Board has estimated that as many as 4.2mn electric vehicles are needed for the state to meet its goal of reducing overall greenhouse gas emissions by 40pc from 1990 levels by 2030. Transportation now accounts for nearly 40pc of the state's total emissions. The state has pushed its three major investor-owned utilities to take steps to support the use of electric vehicles.

Supply

Producers of lithium-ion battery materials, both current and potential, are planning to ramp up output to meet the forecast demand for these metals driven by projected growth in electric vehicles. Chile-based lithium producer SQM has reached an agreement in a long running dispute with government development agency Corfo that will allow the company to increase its lithium carbonate production. Following the implementation of various conditions regarding the management of the company,

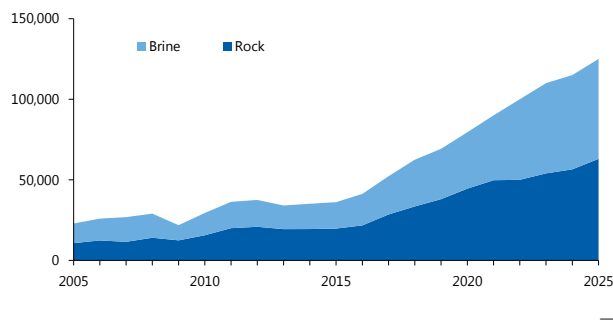
SQM will be able to process and sell up to 1.8mn t of additional lithium carbonate until 2030. In return for a payment of \$17.5mn to Corfo, the companies will have an agreement to sell up to 25pc of lithium production at a preferential price to domestic value-added consumers. The total volumes would be close to 2.2mn t of lithium carbonate, including remaining volumes of around 340,000t (64,816t of lithium metallic equivalent) from the original allocated amounts. This news follows proposals by SQM last year to expand its lithium carbonate production by the second half of 2018 to meet growing demand, principally from battery manufacturers for use in electric vehicles.

Orocobre, which is listed on the Sydney and Toronto exchanges, increased its lithium carbonate output in the December quarter of 2017 and is on track to achieve fiscal 2018 guidance. Lithium carbonate output from the Olaroz facility in Argentina rose by 84pc in the December quarter to 3,937t. Output for the first half of fiscal 2018 was 6,072t. Output guidance for fiscal 2018 was maintained at 14,000t. Sales revenue for the December quarter rose by 72pc from the September quarter to \$40mn, up 67pc on the September quarter. Cash costs for the December quarter at \$3,946/t were 21pc lower than in the September quarter due to higher production volumes. Prices for the first half of calendar 2018 are expected to be 25pc higher than in the second half of calendar 2017, the company said.

Strong demand for lithium chemicals led Orocobre and its joint venture partners to increase the scale of a planned expansion at Olaroz to 25,000 t/yr, increasing total capacity to 42,500 t/yr. Engineering studies were completed with capital expenditure estimated at \$271mn, including a \$25mn contingency. It is 66.5pc owned by Orocobre, 25pc owned by Japan's Toyota Tsusho Corporation and 8.5pc by Argentina's Jujuy Energia y Minería Sociedad del Estado. In mid-January,

Global lithium supply by source, 2005-25

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Toyota Tsusho agreed to buy a 15pc interest in Orocobre in a deal worth A\$292mn (\$232mn).

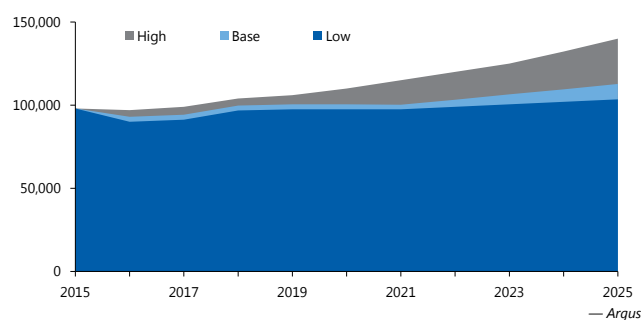
Qinghai Salt Lake, a large Chinese chemical firm, is investing heavily in battery grade lithium carbonate capacity to meet burgeoning demand from the electric vehicle sector. The company started up a 10,000 t/yr production line last year and aims to invest 3bn yuan (\$460mn) to increase this to 60,000 t/yr over the next few years, based on market conditions. It plans to expand capacity at its Lanke Lithium subsidiary to 30,000 t/yr from 10,000 t/yr and build a new 30,000 t/yr production line for battery grade lithium carbonate at its Salt Lake BYD subsidiary. Following the launch of trial production, the company produced 7,759t last year. Unlike other major producers which use spodumene for feedstock, Qinghai Salt Lake extracts lithium chloride from brine around the Qarhan lake in Qinghai province. Fertilizer producer Zangge Holding, located in the same province, plans to launch a 20,000 t/yr project for battery grade lithium carbonate next year.

Sociedad Química y Minera de Chile (SQM) and Perth-based Kidman Resources have received regulatory approval to complete their joint venture to develop the Mt Holland project in Australia. This will include a mine, concentrator and lithium carbonate-hydroxide refinery. Australia's Foreign Investment Review Board gave its approval and other conditions were fulfilled, Kidman Resources said. Kidman has received an initial \$3.5mn payment from SQM. The Chilean company has already paid \$15mn into the joint venture. Kidman will receive a further payment of \$25mn and the JV will receive a further payment of \$60mn once a decision to mine is made. This is expected to be made shortly after a completed definitive feasibility study in the June quarter of 2018.

Work is under way to produce spodumene concentrate from the JV's Earl Grey deposit. This has a mineral resource of 128mn t, grading 1.44pc lithium oxide containing 1.84mn t of metal. A feasibility study has started on a refinery to produce lithium carbonate or hydroxide or a combination of both. Construction of a lithium concentrator is targeted to start in December 2018, followed by a refinery in Western Australia to produce lithium carbonate or hydroxide.

In the cobalt industry, Switzerland-based mining company Glencore announced that it will more than double its cobalt production by 2019 to meet increasing demand from the EV sector. Glencore will increase cobalt output to around 65,000t in 2019, up by 133pc from an estimated total of 27,000t this year. Output will dip slightly in 2020 to 63,000t. Glencore's majority-owned Katanga copper and cobalt mine in the Democratic Republic of Congo will account for 34,000 t/yr of the 65,000 t/yr total increase. The mine will restart in 2018 and will produce 11,000t of cobalt in its first year. Glencore increased its interest in the mine in February. The company's Mutanda operations will also see a production increase, while output at its Integrated Nickel Operations (INO) and Murrin Murrin operations will remain stable over the period. The company is not looking to conclude long-term supply on a fixed-term price basis.

Forecast cobalt supply scenarios, 2015-25



Canada-based Sherritt International has increased its cobalt and nickel guidance for 2018 at its Ambatovy joint venture in Madagascar despite a shutdown in January. Production was shut down because cyclone Ava damaged equipment at

the plant. Operations are not expected to restart before the end of the month. The plant will probably ramp up over the first quarter once repairs and maintenance have been carried out in order to achieve the projected output targets, the company said. Cobalt output guidance at Ambatovy is 3,900-4,200t this year, up from 3,300-3,600t in 2017. Nickel output guidance is 40,000-43,000t, up from 36,000-39,000t. Nickel and cobalt production at Ambatovy fell short of expectations in 2017, with nickel output at 35,474t and cobalt output of 3,053t, due to unplanned maintenance and a shortage of acid availability to feed operations. Nickel and cobalt production guidance at Sherritt's Moa joint venture in Cuba is unchanged at 31,500-32,500t and 3,500-3,800t respectively this year. The company produced 31,525t of nickel and 3,601t of cobalt at Moa in 2017.

China's largest nickel producer, state-owned Jinchuan Group, plans to raise output of battery grade nickel sulphate this year to meet demand from electric vehicle manufacturers. The company will set its 2018 production target after the lunar new year holidays in mid-February. It could produce up to 60,000-70,000t this year, up from the 50,000t produced last year. It is building a new 30,000 t/yr nickel sulphate plant in Fangcheng city in Guangxi province which is scheduled to start production in 2020. Nickel increases the power density of lithium ion batteries, extending the range of electric vehicles. Chinese production of nickel sulphate is expected to reach 470,000t in 2017, up from 440,000t in 2016.

Finnish producer Terrafame plans to invest in a nickel and cobalt chemical plant to cater for growing demand for battery applications from the electrical vehicle sector. The company plans to complete a feasibility study on battery chemical production and aims to make an investment decision in the first half of 2018 and start production at the plant in 2020. The plant will have a production capacity of 150,000 t/yr of nickel sulphate and 5,000 t/yr of cobalt sulphate, which will make Terrafame one of the largest global nickel sulphate producers. The company has concluded an agreement with Galena Asset Management, Trafigura, and Sampo on a private financing package totalling \$200mn. Terrafame produces nickel, cobalt and zinc at its mine and metals production plant in Sotkamo, Finland.

Project tracker						
Company	Country	Project name	Status/start-up	Metal	Resource (mn t)	Output (t/yr)*
Ganfeng/Mineral Resources/Neometals	Australia	Mt. Marion	Operating	Li (r)	23.24 (1.39% Li2O)	~* 35,000
Galaxy/General Mining	Australia	Mt Cattlin	Operating	Li (r)	16.42 (1.08% Li2O)	~* 13,000
Albermarle	Chile	La Negra (expansion)	2018	Li (b)		~* 20,000
Pilbara Minerals	Australia	Pilgangoora	Construction/2018	Li (r)	156.3 (1.25% Li2O)	~* 43,000
Altura	Australia	Pilgangoora	Construction/2018	Li (r)	39.2 (1.05% Li2O)	~* 30,000
Nemaska Lithium	Canada	Whabouchi	Construction/2018/19	Li (r)	32.7 (1.56% Li2O)	~* 27,000
Orocobre	Argentina	Olaroz Phase 2	DFS-Financing/2019	Li (b)		~* 25,000
Enirgi Group	Argentina	Salar de Rincon	Pilot/2019	Li (b)	8.3 (LCE)	~* 50,000
SQM/LAC	Argentina	Cauchari-Olaroz	Construction/2019/20	Li (b)	n.a.	~* 20,000
Galaxy	Argentina	Sal de Vida	DFS/2022	Li (b)	7	~* 25,000
LSC Lithium	Argentina	Pozuelos/Pastos Grandes	PFS/2022	Li (b)	n.a.	n.a.
Chinese producers	China	Various	2017+	Li (b/r)		~* 25,000
Glencore	DRC	Katanga	2018	Cu/Co		~* 11,000
ERG	DRC	Metalkol RTR	2018/19	Cu/Co		~* 14,000
Nzuri Copper Ltd	DRC	Kalongwe	2019+	Cu/Co	6.98 (0.36% Co)	~* 1,500
Cobalt Blue	Australia	Thackaringa	Pre-feasibility (2018)	Co	54.9 (0.68% Co)	
eCobalt	US	Idaho Cobalt	Feasibility completed (2017); fully permitted	Co	3.7 (0.09%Co)	~* 1,500
Fortune Minerals	Canada	Nico	Updated FS in progress (Nov 2017)	Co	33.1 (0.11% Co)	
Jervois Mining	Australia	NiCo Young	Drilling programe in 2018	Ni/Co	167.8 (0.06% Co)	
Ardea Resources	Australia	KNP	Pre-feasibility (2018)	Ni/Co	64.4 (0.13% Co)	
Clean Teq	Australia	Syerston	DFS in progress	Ni/Co/Sc	109 (0.10% Co)	
Panoramic Resources	Australia	Savannah	Feasibility (2016)	Ni/Cu/Co	13.9 (0.11% Co)	~* 7,700

Notes: * - Lithium output in LCE & cobalt in metal content; b = brine, r = rock

Trade

The West Australian port of Port Hedland increased its lithium concentrate (spodumene) exports in December 2017. Lithium concentrate exports rose to 425,896t in December from 303,695t in November and 223,071t in October, the Pilbara Ports Authority (PPA) said. This is in line with growing lithium output in Western Australia which has become the hard rock lithium capital of the world. Exports are expected to rise significantly in 2018 when several more projects move into production and offtake delivery mode in the second half of the year.

China's nickel sulphate imports are likely to rise in 2018 following a cut in import duty. Beijing will introduce a 2pc provisional import duty to replace the 5pc most-favoured-nation tariff at the start of 2018, the finance ministry said. China imported 6,067t of nickel sulphate in January-October 2017, up by 31pc from 4,646t a year earlier.

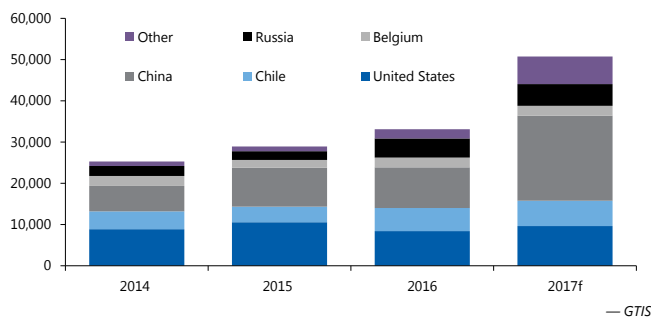
China's lithium hydroxide exports rose further in October 2017, as a result of growing demand from lithium-ion battery producers. China exported 1,670t of lithium hydroxide in October, up by 140pc from 697t in the same month of 2016. The average export price fell by 14pc year on year to \$12.21/kg as a result of growth in supply as price rises in recent years prompted producers to ramp up production. The largest consumer, Japan, imported 1,157t in October, up by 299pc year on year. South Korea's imports rose by 139pc to 336t from a year earlier. The two countries are the world's largest producers of high grade nickel-cobalt-aluminium lithium ternary materials. Global shipments of lithium-ion batter-

ies are expected to reach 265.7GWh in 2020, compared with 115.4GWh in 2016, amid increasing electric car production. Chinese lithium hydroxide exports rose by 109pc to 15,820t in January-October 2017, up from 7,563t in the same period in 2016.

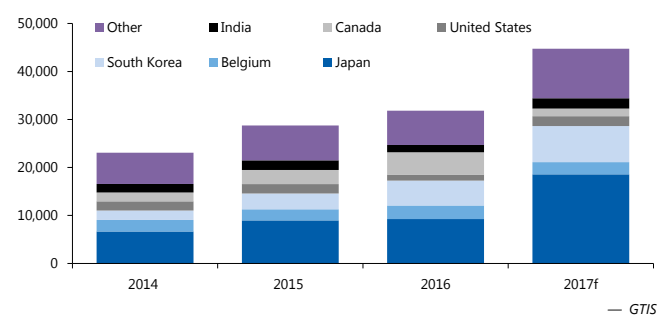
Chile's lithium carbonate exports were basically flat at 54,004t in the first 10 months of 2017, but exports revenues increased by 53pc to \$560mn. Argentina is the next largest lithium carbonate exporter and exports rose 19pc to 21,110t in January to October 2017, while revenues were \$156mn, 31pc up on 2016. Chile is stepping up efforts to develop its lithium industry because of the growing interest in batteries used to power electric vehicles. Besides initiatives to attract foreign investment, lawmakers are expected to consider proposals to create a state-controlled company to exploit lithium. China is offering to invest in Chile's lithium industry at all stages of the production chain, including construction of a factory to produce electric vehicles, seeing an opportunity to tie up major lithium supplies close to production sites.

Chinese cobalt oxide exports fell by 25pc year on year to 684t in October, although the rise in cobalt prices meant that exports revenues jumped by 74pc to \$31.1mn. For January to October, exports dropped by 20pc to 6,673t, while exports revenues increased by 55pc to \$241.6mn with an average value of \$36.21/kg. The UK is the next largest cobalt oxide exporter with exports of 1,026t in the first ten months of 2017, down by 8pc, and export revenues of \$36.2mn, up 73pc.

Lithium oxide/hydroxide exports, 2014-17



Lithium oxide/hydroxide imports, 2014-17



Trade

Battery materials trade							
	October		Year-to-date		2017f	2016	±% 17/16
	Volumes kg	Revenues \$	Volumes kg	Revenues \$	Volumes kg	Volumes kg	
Lithium carbonate exports	10,266,599	113,214,814	901,740,154	692,465,757	109,661,014	107,394,980	2
Chile	6,021,404	68,361,051	54,003,648	560,410,159	64,035,849	65,163,172	-2
Argentina	2,500,384	20,278,084	21,110,369	156,226,200	27,444,496	23,078,116	19
Belgium	426,060	5,223,784	6,171,186	63,594,662	7,361,279	9,850,500	-25
Germany	296,288	3,405,750	2,496,324	27,316,077	2,768,278	3,354,269	-17
China	179,771	3,357,201	1,191,927	26,740,301	1,547,517	1,379,003	12
Lithium oxide exports	5,160,390	46,934,758	41,308,034	480,001,364	50,752,964	33,104,797	53
China	1,670,229	20,401,527	15,819,955	192,406,091	20,607,144	9,851,393	109
US	852,945	8,497,667	8,217,210	90,252,942	9,633,484	8,413,523	14
Chile	574,700	8,622,103	5,324,398	86,116,817	6,130,752	5,598,349	10
Russia	280,101	3,393,719	4,009,122	50,144,144	5,269,834	4,661,507	13
Cobalt oxide exports	1,044,154	40,270,267	9,967,766	321,869,775	11,630,654	13,452,063	-14
China	683,635	31,131,890	6,673,466	241,613,903	7,865,461	9,850,296	-20
UK	146,935	6,259,112	1,025,518	36,166,939	1,159,438	1,256,707	-8
Taiwan	19,746	352,837	326,937	9,873,672	394,826	400,635	-1
Italy	40,757	812,811	298,378	7,493,924	337,770	332,353	2
Nickel sulphate exports	8,832,134	24,486,510	78,903,927	207,146,438	96,464,992	88,973,429	8
Taiwan	4,955,820	14,259,239	38,473,872	104,740,537	47,431,175	35,173,285	35
India	624,280	1,673,467	8,753,069	21,529,774	10,629,102	6,385,379	66
Japan	703,904	2,013,508	6,120,704	16,445,272	7,300,597	10,844,618	-33
Germany	721,324	1,749,598	6,878,669	17,145,033	8,280,906	8,356,111	-1
Manganese dioxide exports	9,256,548	13,587,121	113,690,400	149,802,728	143,659,892	118,472,614	21
China	4,499,990	6,934,414	51,121,843	75,270,154	61,787,302	49,712,207	24
Japan	1,016,795	2,140,312	13,158,065	26,768,186	16,145,349	15,199,914	6
Spain	1,057,331	1,931,753	9,387,515	16,613,902	11,534,484	10,945,610	5
US	426,366	727,866	6,261,641	9,101,876	7,391,436	6,621,371	12
Lithium carbonate imports	10,760,241	110,325,431	95,673,159	953,772,028	119,083,783	108,474,934	10
China	3,074,264	36,993,759	25,297,108	292,449,826	32,609,639	21,793,517	50
South Korea	1,828,146	23,515,651	16,385,982	192,695,250	19,860,411	20,140,362	-1
US	1,878,820	7,637,723	13,756,161	68,308,503	16,675,752	15,567,356	7
Lithium oxide imports	4,218,834	48,759,040	59,728,258	471,317,885	44,771,916	31,836,675	41
Japan	1,307,084	15,571,856	14,634,285	169,647,034	18,566,999	9,250,199	101
South Korea	535,777	9,512,180	5,797,971	109,795,631	7,513,914	5,168,109	45
Belgium	366,408	4,829,825	2,354,554	33,529,428	2,550,242	2,831,400	-10
India	222,014	3,490,385	1,705,383	31,679,624	2,149,700	1,525,692	41
Cobalt oxide imports	2,157,422	87,746,396	22,488,980	704,958,297	26,330,235	26,845,672	-2
South Korea	1,035,783	49,646,963	8,382,577	316,503,265	9,713,358	12,942,516	-25
Spain	143,700	6,424,367	2,614,003	82,046,299	2,938,169	2,758,844	6
China	188,466	7,670,178	2,042,848	66,772,038	2,278,011	382,544	495
US	103,704	4,673,962	1,664,679	56,366,883	1,974,403	1,961,847	1
Nickel sulphate imports (283324)	11,592,708	32,599,783	107,721,954	290,587,379	130,054,922	115,001,257	13
Japan	6,164,407	17,088,636	45,302,268	123,120,037	56,762,949	41,168,370	38
South Korea	1,237,961	3,497,404	19,823,470	53,221,995	23,731,060	22,846,886	4
Germany	293,554	731,515	5,096,230	11,461,559	4,732,117	5,314,597	-11
Canada	563,007	1,585,480	4,706,371	12,253,020	5,449,732	6,422,784	-15
Manganese dioxide imports (282010)	11,800,342	17,123,352	99,226,669	153,073,233	145,510,316	142,699,143	2
Belgium	3,067,367	5,535,221	24,022,898	42,356,095	28,777,215	26,564,400	8
Germany	1,644,608	3,202,638	11,078,330	19,973,830	11,292,604	14,880,227	-12
Singapore	765,001	1,218,435	9,307,079	18,178,687	11,773,688	10,998,307	3
US	734,972	1,589,673	6,454,002	13,606,677	8,109,731	5,495,515	48

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