

### GLOBAL



#### Inside

Resources - you need to be producing now	5
Chemicals – low cost and diversified Intermediaries/mixed – it’s who you’re with	6
Battery makers/tech – China or Tesla	7
Automotive – buses and trucks	9
	11

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# Global Lithium Report

## Fully charged, but no shortage

In this report, we have utilised the expertise of Macquarie’s global commodities, resources, chemicals, technology and automotive teams to analyse the lithium market from cradle to grave. Our conclusion is that a 50% lithium price increase since the start of last year is being driven by short-term supply side constraints. However we believe the raw materials market will move back into balance within 18 months. Longer term we are positive on the sector outlook driven primarily by our 31% CAGR for lithium demand in New Energy Vehicle (NEV) batteries out to 2021. Beyond the raw material suppliers, we see other opportunities within the supply chain for global investors to leverage this strong growth sector.

### Resources - you need to be producing now

Within this report we cover ~90% of current global lithium producers as well as many of the aspirant project developers. For those looking at lithium as a pure commodity play, our global picks are Orocobre (ORE AU, A\$4.35, Outperform, TP: A\$5.00) and Neometals (NMT AU, A\$0.46, Outperform, TP: A\$0.55). One is a brine producer, the other a hard-rock miner who will be two of the few suppliers adding significant volume in 2016.

### Chemicals – low cost and diversified

Lithium is currently a small component of both Albemarle (ALB US, US\$80.09, Outperform, TP: US\$88.00) and FMC (FMC US, US\$48.12, Neutral, TP: US\$51.00), but one which is becoming increasingly profitable to both. ALB is our preferred pick for this space as they are the largest lithium producer globally, will start production from their delayed La Negra plant in Q4CY16 and will likely use the increased cashflow to deleverage more aggressively.

### Intermediaries/mixed – it’s who you’re with

We are positive for the potential in this space, and see both Sumitomo Metal Mining (5713 JP, ¥1,116, Outperform, TP: ¥1,300) and Leclanché (LECN SW, CHF3.03, Outperform, TP: CHF3.50) as having a bright future. SMM are the more traditional play, their contract to Panasonic Corporation (6752 JP, ¥965, Outperform, TP: ¥1,420) and Tesla (TSLA NYSE, Not Rated) offering much potential as they ramp up their plants. LECN are our blue-sky pick after their success with the Ontario Government and they continue to target the sector from which we expect the strongest CAGR, energy storage.

### Battery makers/tech – China or Tesla

For battery makers, our expectation of growth is primarily linked to either China or Tesla, with respective CAGRs of 35% and 48% from 2015’s levels to 2021. As such, our picks for the space are LG Chem (051910 KS, Won275,000, Outperform, TP: Won405,000) due to what we believe will be strong sales into the China commercial vehicle market, and Panasonic, linked to their supply for Tesla.

### Automotive – buses and trucks

When automotives and NEVs are discussed it’s primarily relating to Tesla, but in sheer volume terms we see China as the largest growth driver. Going from ~350k NEV units in 2015, we expect China will be producing 2mill units by 2021. And our pick to play this theme is Zhengzhou Yutong Bus (A-Share) (600066 CH, Rmb19.14, Outperform, TP: Rmb28.00) who having been ramping up sales of e-buses each month in 2016.

31 May 2016

# Global Lithium Report

## Fully charged, but no shortage

**Prices for lithium took off in 2015 and have continued to rise**

In sharp contrast to other commodities, prices for lithium took off in 2015 and have continued to rise, as the long-anticipated electric vehicle story accelerated. Lithium demand was up 8% YoY overall and 22% YoY in batteries last year. The rally has been aided by established producers consciously not lifting output to meet this demand. The result is a China imported lithium carbonate price up 50% since the start of last year, from ~\$4,700/t to ~\$7,000/t in April.

**Fig 1 Lithium supply and demand snapshot (tonnes LCE)**

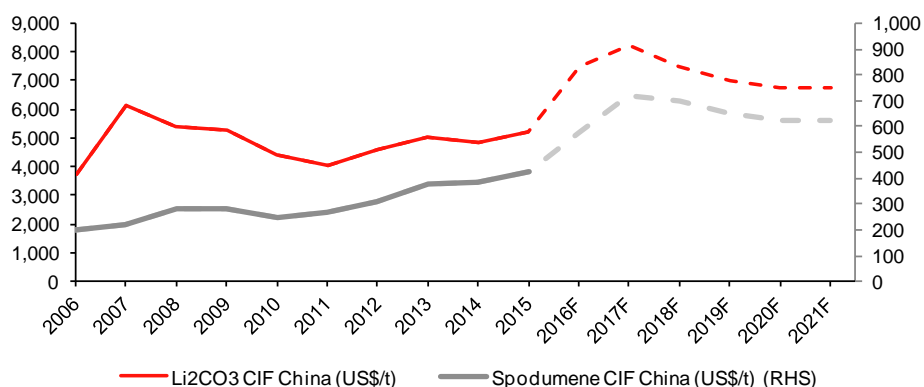
Demand	2015	2016F	2017F	2018F	2019F	2020F	2021F
Batteries	55,242	62,819	77,652	92,340	105,706	122,946	141,955
Non-battery	118,511	121,765	125,767	129,617	133,581	137,713	141,811
<b>Total</b>	<b>173,754</b>	<b>184,584</b>	<b>203,418</b>	<b>221,958</b>	<b>239,287</b>	<b>260,660</b>	<b>283,766</b>
YoY	8%	6%	10%	9%	8%	9%	9%
Supply	2015	2016F	2017F	2018F	2019F	2020F	2021F
Argentina	19,210	29,453	33,869	34,828	35,299	35,781	36,276
Australia	58,261	64,327	80,635	90,156	92,332	92,332	92,332
Chile	58,437	61,893	66,806	74,860	80,735	83,578	83,578
Other	24,065	24,370	24,720	24,970	25,220	25,470	25,720
<b>Total</b>	<b>159,972</b>	<b>180,043</b>	<b>206,029</b>	<b>224,814</b>	<b>233,586</b>	<b>237,161</b>	<b>237,905</b>
YoY	0%	13%	14%	9%	4%	2%	0%
<b>Additional supply required</b>	<b>13,781</b>	<b>4,541</b>	<b>-2,610</b>	<b>-2,856</b>	<b>5,702</b>	<b>23,499</b>	<b>45,861</b>
Spare capacity at existing assets			66,619	57,160	50,489	47,007	46,512
Planned from most likely projects			0	43,718	99,666	132,766	146,766

Source: Customs data, Company data, Macquarie Research, May 2016

**Based on our detailed supply/demand analysis, we believe the market will remain tight through 2016 and 2017, but has no long term supply constraint**

Based on our detailed supply/demand analysis, we believe that having gone into deficit last year the market will remain tight through 2016 and 2017, despite more supply coming from Australia and Argentina. As a result, we are bullish on lithium on an 18-month view. However, it is our view that structurally lithium has no supply capacity constraint.

**Fig 2 Macquarie LCE and spodumene price forecasts**



Source: Customs data, Company reports, Macquarie Research, May 2016

**Four producers control 90% of global output and are producing well below capacity**

Four producers control 90% of global output and are producing well below capacity, we believe in an attempt to support prices. This has worked so far, but there is a swathe of new capacity planned from 2018, which is looking increasingly viable following the recent rally. On our forecasts existing assets plus two Australian mines starting this year could theoretically meet all projected demand growth. We believe to protect market share and keep new entrants out existing producers will be forced to raise volumes.

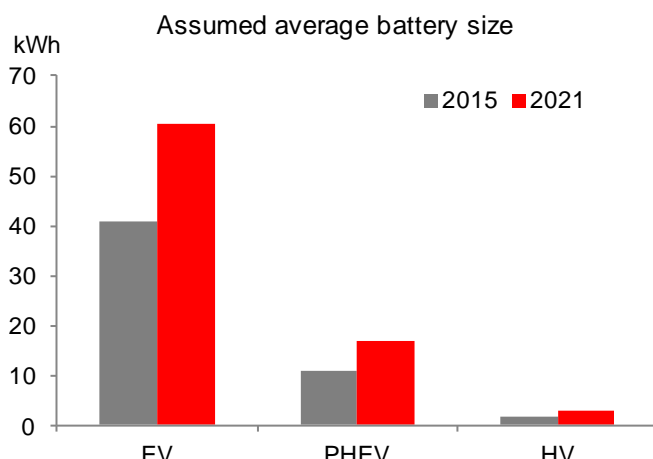
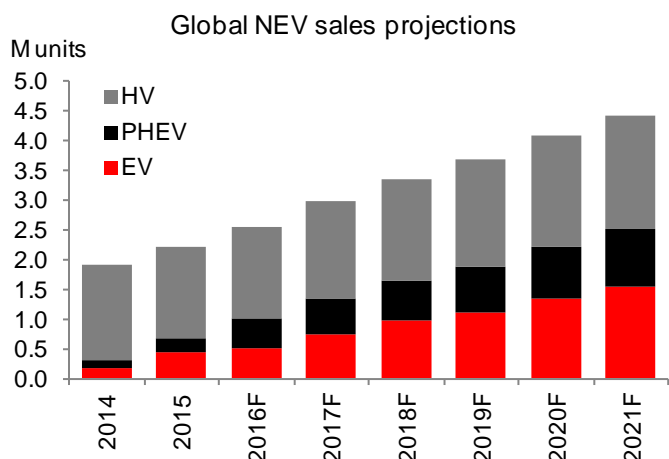
### The best demand story among the mined commodities

**We forecast a CAGR of 9% to 2021**

In a world where many commodities are struggling for any consumption growth, we believe lithium has the most compelling demand story. We forecast a CAGR of 9% to 2021. New energy vehicle (NEV) batteries are the essence of the story and we forecast demand from this sector grows at a 31% CAGR to 2021, at which point they would account for one-third of all lithium demand versus just one-tenth today. We think external consultants are underestimating this demand potential.

**Fig 3 The NEV growth is mostly driven by EVs and PHEVs...**

**Fig 4 ...which is a positive for lithium demand since battery size matters. EVs only ~20% global sales, yet over 80% of lithium auto battery demand**



Source: National data, LMC Automotive, Macquarie Research, May 2016

Source: Macquarie Research, May 2016

### China's 'shadow' Lithium market - Off contract sales could provide material short term pricing upside

**Lithium market is small and pricing mechanisms are opaque**

As with many other strategic or speciality metals the lithium market is relatively small and pricing mechanisms are opaque. There is no exchange for trading the metal with pricing generally determined by bi-lateral agreement between supplier and consumer. There is no spot market and no defined spot price but there is what can be termed an 'off-contract' market linked primarily to Chinese conversion sector which has effectively been cut out of the global spodumene supply chain by the ALB/Tianqui acquisition of the Greenbushes mine. Off-contract pricing can be substantially higher than contract rates although typically volumes are small.

**'Off-contract' deals have achieved prices of US\$12,000/t to US\$19,000/t**

We expect new and aspirant producers to operate largely in the off-contract market. Anecdotally we understand that volumes being sold in public auctions or in off-contract deals have achieved prices of US\$12,000/t to US\$19,000/t. We also note that recent price guidance from ORE suggests that they expect to receive average prices of US\$10,000/t LCE in 3QCY16, a 21% premium on our forecast peak benchmark price of US\$8,250/t in CY17.

This is not unusual behaviour in industrial minerals markets and we look to historical analogues in the minerals sands market in particular, as well a rare earths, uranium and although a much larger market, iron ore.

**Upward pricing pressure in this secondary market to remain in the short-term**

Ahead of the full ramp up of Mt Cattlin and Mt Marrison we expect this situation to persist, and should either of the new spodumene projects stumble then we would expect upward pricing pressure in this secondary market to remain.

### As always timing is key

We conclude that timing is key for raw materials suppliers. We have Outperform recommendations on the most near term producers ORE and NMT, and Underperform recommendations from GXY, PLS and AJM.

Fig 5 Listed equities from within report and recommendations

#	Company	Code	Listed	Sector	Analyst	Recommendation	Market Cap (m)	Price	Price Target	TSR
<b>Raw materials</b>										
1	Orocobre	ORE	ASX	Brine extraction	Andrew Hodge	Outperform	911	4.35	5.00	15%
2	Neometals	NMT	ASX	Hard-rock miner	Ben Crowley	Outperform	235	0.46	0.55	20%
3	Bacanora	BCN	LON	Hard-rock developer	Patrick Morton	Outperform	109	0.99	1.20	21%
4	Pilbara Minerals	PLS	ASX	Hard-rock developer	Ben Crowley	Underperform	743	0.70	0.64	(9%)
5	Galaxy	GXY	ASX	Hard-rock miner	Ben Crowley	Underperform	565	0.40	0.42	5%
6	Altura Mining	AJM	ASX	Hard-rock developer	Andrew Hodge	Underperform	235	0.24	0.20	(21%)
<b>Chemicals / brine extraction</b>										
7	Albemarle	ALB	NYSE	Chemicals / brine extraction	Cooley May	Outperform	8,994	80.09	88.00	11%
8	FMC	FMC	NYSE	Chemicals / brine extraction	Cooley May	Neutral	6,436	48.12	51.00	7%
<b>Intermediaries / mixed</b>										
9	Sumitomo Metals and Mining	5713	JP	Mixed	Polina Diyachkina	Outperform	646,770	1,112	1,300	19%
10	Leclanche	LECN	SW	Mixed	Dilip Kejriwa	Outperform	115	3.0	3.5	16%
11	Tianqi	2466	CH	Mixed	na	na	na	na	na	na
<b>Battery makers / tech</b>										
12	LG Chem	51910	KS	Battery/tech	Anna Park	Outperform	18,059,000	272,500	405,000	51%
13	Panasonic	6752	JP	Battery/tech	Damian Thong	Outperform	2,367,000	965.00	1,420.00	50%
14	Samsung SDI	6400	KS	Battery/tech	Soyun Shin	Underperform	7,564,000	108,500	90,000	(16%)
<b>Automotive</b>										
15	Zhengzhou Yutong Bus	600066	CH	Automotive	Zhixuan Lin	Outperform	42,308,000	19.11	28.00	52%
16	BYD	1211	HK	Automotive	Janet Lewis	Underperform	105,111	44.65	26.10	(40%)

\*All figures are in local currency of their respective exchange as at May 27, 2016

Source: IRESS, Bloomberg, Macquarie Research, May 2016

## Resources - you need to be producing now

### Orocobre

***Olaroz coming to market exactly when prices are rising***

Whilst it has taken a long time to perfect ORE's Olaroz is beginning to hit targets. With lithium demand increasing at a rapid rate, we see ORE's ramp-up operation Olaroz coming to market exactly when prices are rising due to supply constraints. This has been exemplified in Olaroz's rising price every month in 2016 as they increase production.

### Neometals

***Mt Marion project as the largest and lowest risk new addition to hard rock lithium supply***

We see NMT's Mt Marion project as the largest and lowest risk new addition to hard rock lithium supply. The mine is expected to produce ~200,000tpa of 6% spodumene concentrate and should account for around 50% of the current Lithium Carbonate Equivalent (LCE) shortfall. NMT is a minority partner (26.9%) in the Mt Marion Joint Venture. The project is being constructed by Mineral Resources under a BOO contract and life-of-mine off-take has been secured with China's second largest lithium producer, Ganfeng Lithium which is also the majority equity partner and off-taker.

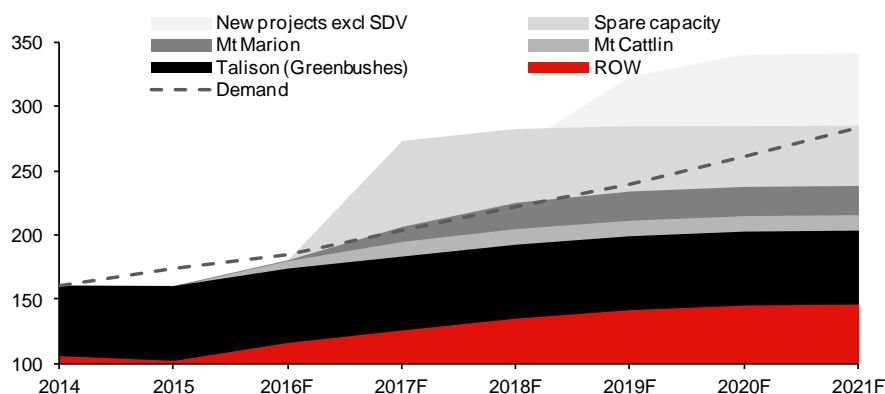
### Galaxy Resources

***We are positive on GXY's Mt Cattlin but do not believe that medium term demand supports the development of the company's Sal de Vida brine project***

We are also positive on GXY's Mt Cattlin project which we expect to be in production before the end of the year. GXY has binding off-take agreements with two undisclosed China-based buyers for delivery of 60,000t spodumene concentrate in 2H CY16, and a further 120,000t in CY17. CY16 off-take has been secured at US\$600/t FOB for minimum 5.5% Li concentrate.

However, we do not believe that medium term demand supports the development of the company's Sal de Vida brine project and hence see the stock as fully valued.

**Fig 6 But we believe existing capacity will satisfy long term demand**



Source: Customs data, Company data, Macquarie Research, May 2016

### Pilbara Minerals

***PLS's Pilgangoora could become the largest listed spodumene producer but is likely to enter the market in a declining price***

The same is true of PLS which on current projections will have to compete directly with increased utilisation of existing capacity. PLS's Pilgangoora could become the largest listed spodumene producer. However, we believe that the window for new entrants in the hard rock lithium market will be short lived. Potential production disappointments for existing and new operations would clearly benefit PLS, as would stronger than forecast demand but we currently see Pilgangoora entering the market at a time of oversupply and declining prices.

### Altura Mining

AJM is proposing to build its own Pilgangoora project, immediately adjacent to PLS's project for lower capex, lower opex and quicker. We do not believe that AJM will be able to meet its aggressive timelines, nor do we believe that it is a superior project to PLS.

### Bacanora

Being the only listed lithium developer on the London exchange we believe that Bacanora is likely to benefit from a scarcity of investable options within that market.

## Chemicals – low cost and diversified

***ALB is our preferred pick for this space as they are the largest lithium producer globally***

Lithium is currently a small, but important component of both Albemarle (ALB US, US\$80.09, Outperform, TP: US\$88.00) and FMC (FMC US, US\$48.12, Neutral, TP: US\$51.00), but one which is becoming increasingly profitable to both. ALB is our preferred pick for this space as they are the largest lithium producer globally, will start production from their delayed La Negra plant in Q4CY16 and will likely use the increased cashflow to deleverage more aggressively.

### **Albemarle**

- When including its JV interests, ALB is the world's largest lithium producer, with both low cost brine-based assets in Chile and notable exposure to Australian spodumene through its Talison JV with partner Tianqi.
- Though its lithium assets appear set to generate only ~25% of 2016E EBITDA, our analysis suggests that this business adds a growth engine to the firm's above-avg. cash flow capabilities across the rest of its portfolio (catalysts, surface treatment and bromine).
- Given a clear line of sight to balance sheet improvement and a generally high level of upside risk to Street profit estimates, we see ALB as among our top chemical picks.

### **FMC**

- FMC is the third largest global lithium producer on an LCE basis, with its upstream production being tied to Argentine brine assets.
- Despite this seemingly significant position in lithium and its derivative capabilities, lithium represents less than 10% of FMC annual aggregate profit. Indeed, management focus at FMC lies largely beyond its lithium assets in Ag/crop protection and Health & Nutrition products.
- In our view, the lack of FCF and uncertainties in these businesses has resulted in limited options and a focus on optimizing existing assets, not on notable expansion. All in, we remain on the sidelines with a Neutral rating on FMC and continue to view ALB as the best way to play lithium return/profit growth under our US coverage.

***Despite this seemingly significant position in lithium and its derivative capabilities, lithium represents less than 10% of FMC annual aggregate profit***

# Intermediaries/mixed – it’s who you’re with

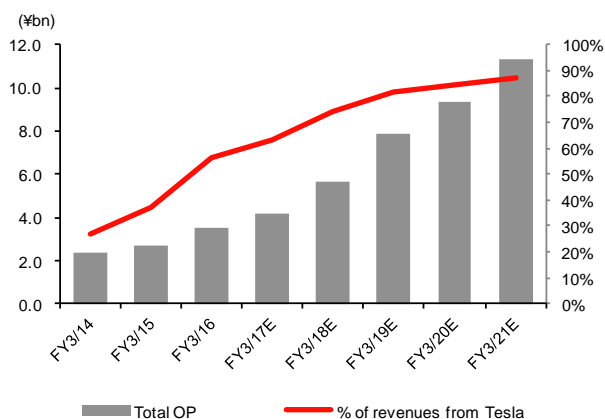
We are positive for the potential in this space, and see both Sumitomo Metal Mining (5713 JP, ¥1,116, Outperform, TP: ¥1,300) and Leclanché (LECN SW, CHF3.03, Outperform, TP: CHF3.50) as having a bright future. SMM are the more traditional play, their contract to Panasonic Corporation (6752 JP, ¥965, Outperform, TP: ¥1,420) and Tesla (TSLA NYSE, Not Rated) offering much potential as they ramp up their plants.

**SMM as the main supplier of nickel and lithium compounds for two of the largest battery**

## Sumitomo Mining and Metals

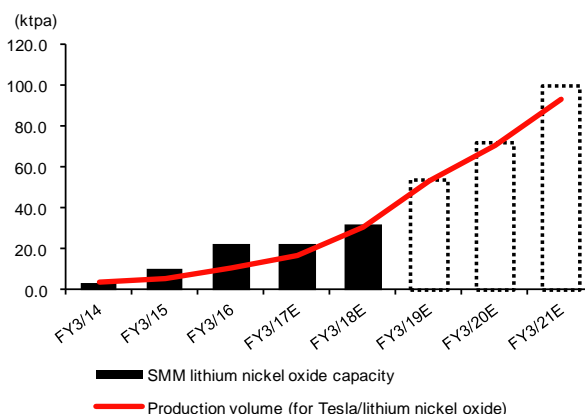
Whilst SMM’s earnings are largely driven by gold, copper and nickel the company is also the major supplier of nickel to Toyota and Panasonic, used in battery cathodes in hybrid vehicles (HEVs) and Tesla EVs. We do not think that higher lithium prices will serve as a constraining factor for battery growth and expect SMM as the main supplier of nickel and lithium compounds for two of the largest battery manufacturers and we expect the company to continue to benefit from increased battery demand.

**Fig 7 SMM battery materials OP vs. % of battery material revenues from Panasonic/Tesla**



Source: Company data, Macquarie Research, May 2016

**Fig 8 SMM lithium nickel oxide capacity upgrades vs. Tesla production**



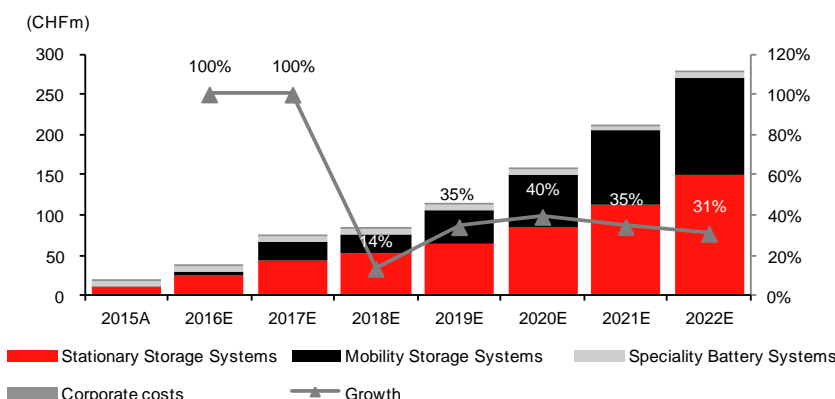
Source: Company data, Macquarie Research, May 2016

## LECN

**LECN are our blue-sky pick offering battery solutions based on Li-ion cells for utility-scale generation and micro grids**

LECN are our blue-sky pick. The company offers battery solutions based on Li-ion cells for utility-scale generation and micro grids, e-transport and commercial and industry battery systems. After their success in winning one of the world’s largest utility-scale 53MWh stationary storage systems project in Canada, the company continues to target the sector where we expect the strongest long term CAGR of 35%, energy storage systems.

**Fig 9 Revenue >3.0x by 2017 (Contracts already won = c.40% of '17 revenue)**



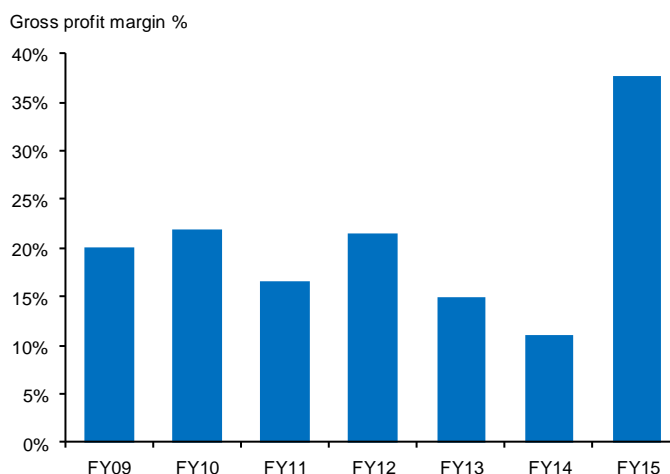
Source: Macquarie Research, Company Data, May 2016

***Tianqi is the world's  
2nd largest lithium  
producer and a  
significant  
integrated upstream  
player***

## Tianqi

Our China team recently visited Tianqi Lithium's processing plant in Shehong, Sichuan Province. Tianqi is the world's 2nd largest lithium producer and a significant integrated upstream player. The company controls world's largest spodumene mine at Greenbushes in Western Australia and has two processing plant in China. Tianqi produces various lithium compounds, including industry and battery grade lithium carbonate, lithium hydroxide and lithium chloride.

**Fig 10 Tianqi's margins have doubled since taking control of Greenbushes**



Source: Tianqi Lithium, Macquarie Research, May 2016

Tianqi is the market leader in China's battery-grade lithium carbonate market, owning c.54% market share. In addition, Tianqi's 51% controlling stake in Talison gives the company an unparalleled edge since c.70% of the raw material used in China's lithium processing plants are imported from Talison's Greenbushes mine in 2015. In this regard, Tianqi can not only secure its raw material supply (both in terms of volume and price) but also restrict the supply to its competitors. We note that Tianqi expects the LCE price to cool from 2H16 as the new capacity comes online in conjunction with increases in domestic production.



## Battery makers/tech – China or Tesla

For battery makers, our expectation of growth is primarily linked to either China or Tesla, with respective CAGR's of 35% and 48% from 2015's levels to 2021. As such, our picks for the space are LG Chem (051910 KS, Won275,000, Outperform, TP: Won405,000) due to what we believe will be strong sales into the China commercial vehicle market, and Panasonic, linked to their supply for Tesla.

### Panasonic

*We see Panasonic's future in lithium inherently tied to the success of Tesla.*

We see Panasonic's future in lithium inherently tied to the success of Tesla. And though they are forecasting an expanded sales base, this will form the basis of their success in LiB.

- **28% CAGR in revenue for automotive** – from ¥202bn in FY3/17 to ¥537bn in FY3/21. Automotive LiBs will account for 10% of Panasonic's OP in FY3/21E, vs <5% in FY3/17.
- **Strong shipment increase, rising from 7.5-8GWh in FY3/17 to ~42GWh in FY3/21.**
  - ⇒ We do not assume that Tesla will ship more than 0.5m cars even in FY3/21 – in contrast to Elon Musk's exceedingly ambitious goal of 1m cars by 2020-21. We believe that Panasonic's own mid-term targets do not assume the new goal either.
- **Technology:** We believe Panasonic's work with Tesla will deliver substantial improvements in battery capacity and cost/kWh for the Model 3 – we estimate that by FY3/18 Panasonic will reach <US\$130/kWh from ~US\$230/kWh in FY3/16; we assume that US\$100/kWh will be achievable by FY3/22. Panasonic has indicated that these technologies will be applied to prismatic LiBs in combinations with advances in safety and pack design. This could in turn have knock-on effects for others in our value chain.
- **New investments:** To support growth, Panasonic has been investing in the Gigafactory in Nevada as well as new prismatic cell capacity in Sumoto, Japan (operational in FY3/17) and Dalian (operational in FY3/18). The Dalian plant is being built as a joint venture with Dalian Levear Electric at a cost of ¥50bn.

### LG Chem

*Undervalued due to a combination of over-estimating the impact of Chinese suspension of NCM batteries in e-buses and undervaluing their battery material technology.*

We believe the market is undervaluing LG Chem due to a combination of over-estimating the impact of Chinese suspension of NCM batteries in e-buses and undervaluing their battery material technology.

- **EV battery sales remain solid despite recent events in China:** As per our latest trip, LG management seems confident of meeting target sales for EV batteries of Won1.2/2.0/3.0tn for FY16/17/18. This is in line with our view that recent two China issues including 1) suspension of NCM type of batteries for e-buses; and 2) new regulation on EV battery subsidies won't be critical to LG Chem's EV battery business.
- **Battery technology + unit cell cost drop via economies of scale:** Rising Li prices suggest stronger battery demand, which should translate into lower battery unit cell manufacturing costs via economies of scale. More importantly, we believe LG Chem would continue to keep its cost leadership based on its material technology. In fact, despite a continuous rise in Li prices since 2011, LG Chem has reduced its battery costs by 40%.

**Fig 4 Battery specification comparison - GM Volt (Gen I) vs. Bolt (Gen II)**

	Generation I, Volt	Generation II, Bolt	Unit	% Change
Average ASP	500.0	300.0	\$/kwh	-40%
Energy	16.4	18.4	kwh	12%
# of battery cell	288.0	199.0	cells	-31%
Voltage output	3.7	3.7	volt	0%
Amount of energy storage (Energy density)	15.4	25.0 ampere hour (Ah)		62%

Source: Macquarie Research, November 2015

## Samsung SDI

### *Samsung SDI lacking the customer base*

For Samsung SDI, their problem lies in that they do not have a link to a large baseload customer or customer group to leverage increased demand, unlike our two preferred picks.

- **Securing an order for mass models is crucial for cost reduction:** Battery companies reduce their cell manufacturing costs by winning orders for large volumes. Unfortunately, Samsung SDI have not managed to secure such a customer.
- **Suspension of NCM batteries for E-buses in China locks out Samsung SDI:** Unfortunately for Samsung SDI, the hope that they could secure a contract to supply the promising e-bus market in China and start to enjoy economies of scale. But a recent ban has yet to be lifted and meant Samsung SDI.

**Fig 11 New capacity expansion and earnings forecast of EV batteries: likely to stay unprofitable in 2018E**

CAPEX and DEPRECIATION	2013	2014	2015	2016	2017	2018	2019	2020	2021
FX									
Economic Useful Life									
Capacity('000 KWh)	100	500	1,800	3,200	5,300	8,000	12,500	19,000	23,700
Adding Capacity	100	400	1,300	1,400	2,100	2,700	4,500	6,500	4,700
Required Capacity	100	500	1,800	3,200	5,300	8,000	12,500	19,000	23,700
Capex per line	220	200	200	190	180	170	160	160	150
Total capex	150	197	212	302	368	580	788	570	200
Depreciation	19	38	62	89	126	172	245	343	325
Total capex (Won bn)	150	197	212	302	368	580	788	570	200
TOPTAL Depr.	19	38	62	89	126	172	245	343	325
EARNINGS CALCULATION	2013	2014	2015	2016	2017	2018	2019	2020	2021
YoY ASP decline									
Global Battery demand (Mwh)			17,242	24,892	34,907	46,722	73,395	111,442	139,303
SDI's market share			10%	13%	15%	17%	17%	17%	17%
ASP(US\$)	1,100	600	330	304	279	257	236	217	200
Required KWh('000)	76	427	1,781	3,112	5,236	7,943	12,477	18,945	23,681
Previous	76	427	1,897	3,485	5,725	8,410	13,211	20,060	25,075
SDI EV batteries (Won bn)	84	256	534	945	1,462	2,041	2,950	4,121	4,739
ASSUMPTIONS									
Sales exposure to Korea fab	100%	100%	80%	60%	45%	45%	40%	40%	40%
ASP	320	304	289	274	261	245	225	201	177
YoY		-5%	-5%	-5%	-5%	-6%	-8%	-11%	-12%
Cost	1,100	605	424	360	288	245	208	177	159
YoY		-45%	-30%	-15%	-20%	-15%	-15%	-15%	-10%
Sales exposure to China fab			20%	40%	55%	55%	60%	60%	60%
ASP	320	304	280	258	237	218	196	167	142
YoY		-5%	-8%	-8%	-8%	-8%	-10%	-15%	-15%
Cost			318	270	216	184	156	133	113
YoY				-15%	-20%	-15%	-15%	-15%	-15%
<b>SDI's OPM (%)</b>	<b>-93%</b>	<b>-65%</b>	<b>-55%</b>	<b>-28%</b>	<b>-9%</b>	<b>-1%</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>
<b>SDI's OP (Won bn)</b>	<b>(78)</b>	<b>(166)</b>	<b>(294)</b>	<b>(265)</b>	<b>(132)</b>	<b>(23)</b>	<b>140</b>	<b>221</b>	<b>249</b>

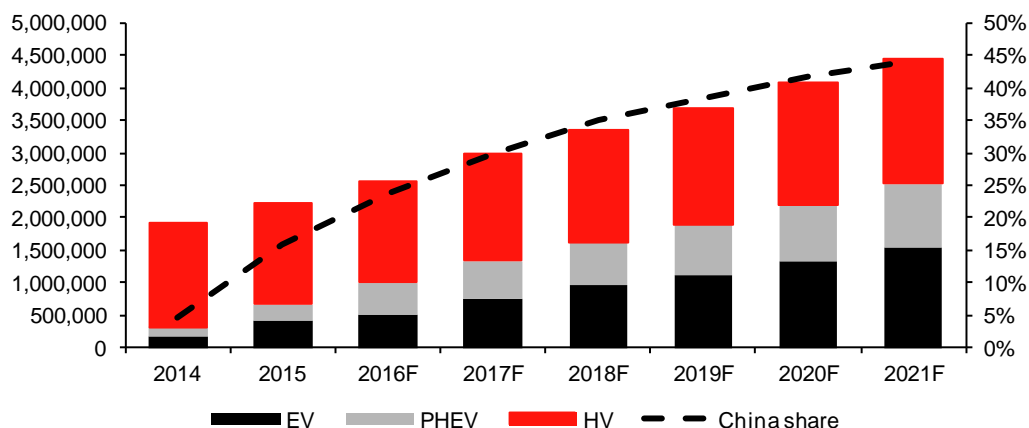
Source: Bloomberg, Macquarie Research, May 2016

## Automotive – buses and trucks

**In volume terms we see China as the largest growth driver**

When automotives and NEVs are discussed it's primarily relating to Tesla, but in sheer volume terms we see China as the largest growth driver. Going from ~350k NEV units in 2015, we expect China will be producing 2mill units by 2021. And our pick to play this theme is Zhengzhou Yutong Bus (A-Share) (600066 CH, Rmb19.14, Outperform, TP: Rmb28.00) who having been ramping up sales of e-buses each month in 2016.

**Fig 12 China's growing importance in the EV market**



Source: Macquarie Research, May 2016

We see China's share of the global electric growing significantly over the coming years. This not only drives our view that the chemistry of Chinese made batteries, Lithium Iron Phosphate (LFP), will become more and more important. But also that those most levered to this market could see gain the most out of all the sectors we examine.

### Zhengzhou Yutong Bus (A-Share)

**We expect that demand for buses in China should grow at 5% pa in 2016-2020, driven by rapid urbanization**

- **Rising demand for buses and E-buses to reduce emissions.** We expect that demand for buses in China should grow at 5% pa in 2016-2020, driven by rapid urbanization. This will be a part of the push to reduce emissions by replacing diesel buses with low-emission E-buses. Yutong is China's biggest bus and E-bus manufacturer, and we estimate its total E-bus sales should reach 50k units in 2020 from 20.4k units in 2015.
- **Revising up 2016 E-bus sales target.** Yutong has recently increased its 2016 sales guidance from 0-10% to over 20% sales volume growth. Management believes the investigation into overall subsidy fraud in 2015 and the potential optimization of the subsidy scheme will be announced soon, which should enable E-bus buyers to finalize their purchasing decisions.
- **Product mix upgrade should boost margins.** Overall, E-buses have higher ASPs and margins than conventional buses, therefore a higher volume contribution from E-buses should boost the overall product mix going forward. The ASP of conventional buses should continue to rise due to better features in the long run, although the decline of raw material prices should lead to lower ASPs in the short term.

### BYD

**BYD also benefiting from E-buses**

- BYD is finally seeing a material impact on its profitability from new energy vehicles, in particular from E-buses, which are seeing strong demand from municipal transit authorities focused on improving air quality. This has resulted in rising demand for E-buses to replace diesel ones. BYD is also benefiting from rising demand for new energy vehicles in cities like Shanghai and Shenzhen, where free plates are offered for buyers of NEVs.
- Despite the rising trend in profitability, we continue to view BYD's shares as richly valued relative to other automakers, especially as competition will mount from 2018.

## Important disclosures:

Recommendation definitions	Volatility index definition*	Financial definitions
<p><b>Macquarie - Australia/New Zealand</b> Outperform – return &gt;3% in excess of benchmark return Neutral – return within 3% of benchmark return Underperform – return &gt;3% below benchmark return</p> <p>Benchmark return is determined by long term nominal GDP growth plus 12 month forward market dividend yield</p> <p><b>Macquarie – Asia/Europe</b> Outperform – expected return &gt;+10% Neutral – expected return from -10% to +10% Underperform – expected return &lt;-10%</p> <p><b>Macquarie – South Africa</b> Outperform – expected return &gt;+10% Neutral – expected return from -10% to +10% Underperform – expected return &lt;-10%</p> <p><b>Macquarie - Canada</b> Outperform – return &gt;5% in excess of benchmark return Neutral – return within 5% of benchmark return Underperform – return &gt;5% below benchmark return</p> <p><b>Macquarie - USA</b> Outperform (Buy) – return &gt;5% in excess of Russell 3000 index return Neutral (Hold) – return within 5% of Russell 3000 index return Underperform (Sell) – return &gt;5% below Russell 3000 index return</p>	<p>This is calculated from the volatility of historical price movements.</p> <p><b>Very high-highest risk</b> – Stock should be expected to move up or down 60–100% in a year – investors should be aware this stock is highly speculative.</p> <p><b>High</b> – stock should be expected to move up or down at least 40–60% in a year – investors should be aware this stock could be speculative.</p> <p><b>Medium</b> – stock should be expected to move up or down at least 30–40% in a year.</p> <p><b>Low-medium</b> – stock should be expected to move up or down at least 25–30% in a year.</p> <p><b>Low</b> – stock should be expected to move up or down at least 15–25% in a year.</p> <p>* Applicable to Asia/Australian/NZ/Canada stocks only</p> <p><b>Recommendations</b> – 12 months <b>Note:</b> Quant recommendations may differ from Fundamental Analyst recommendations</p>	<p>All "Adjusted" data items have had the following adjustments made: Added back: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives &amp; hedging, IFRS impairments &amp; IFRS interest expense Excluded: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends &amp; minority interests</p> <p><b>EPS</b> = adjusted net profit / epowa* <b>ROA</b> = adjusted ebit / average total assets <b>ROA Banks/Insurance</b> = adjusted net profit / average total assets <b>ROE</b> = adjusted net profit / average shareholders funds <b>Gross cashflow</b> = adjusted net profit + depreciation *equivalent fully paid ordinary weighted average number of shares</p> <p>All Reported numbers for Australian/NZ listed stocks are modelled under IFRS (International Financial Reporting Standards).</p>

## Recommendation proportions – For quarter ending 31 March 2016

	AU/NZ	Asia	RSA	USA	CA	EUR	
Outperform	50.34%	59.09%	46.67%	44.76%	60.66%	46.12%	(for global coverage by Macquarie, 3.72% of stocks followed are investment banking clients)
Neutral	34.14%	25.66%	32.00%	49.90%	30.33%	35.10%	(for global coverage by Macquarie, 4.79% of stocks followed are investment banking clients)
Underperform	15.52%	15.26%	21.33%	5.33%	9.02%	18.78%	(for global coverage by Macquarie, 2.31% of stocks followed are investment banking clients)

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