

KEY CONCERNS FOR THE LITHIUM INDUSTRY TO THE END OF THE DECADE

LITHIUM SUPPLY & MARKETS CONFERENCE MONTREAL, CANADA

31 MAY 2017



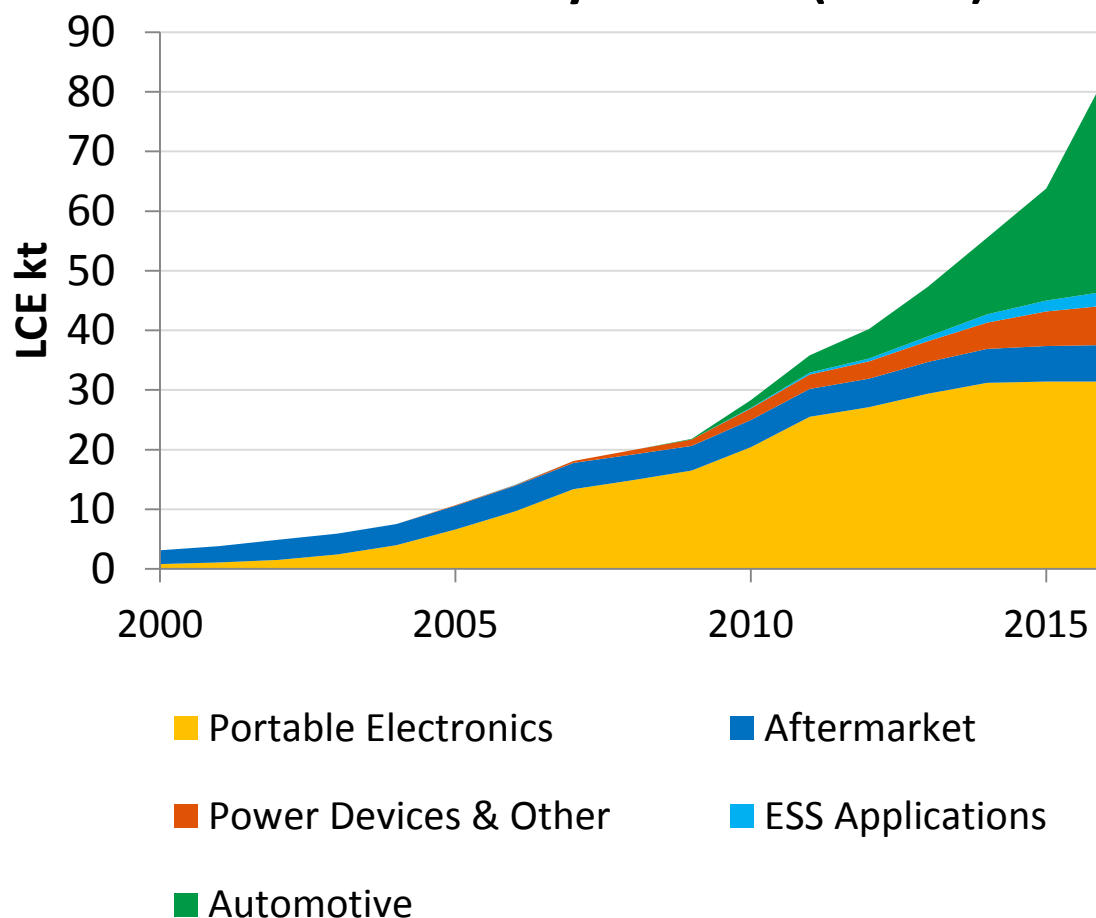
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DEMAND



BATTERY GROWTH IN THE AUTO SEGMENT HAS GENERATED SIGNIFICANT LITHIUM DEMAND

**Lithium Consumption by
Li-ion Battery End Use (LCE kt)**

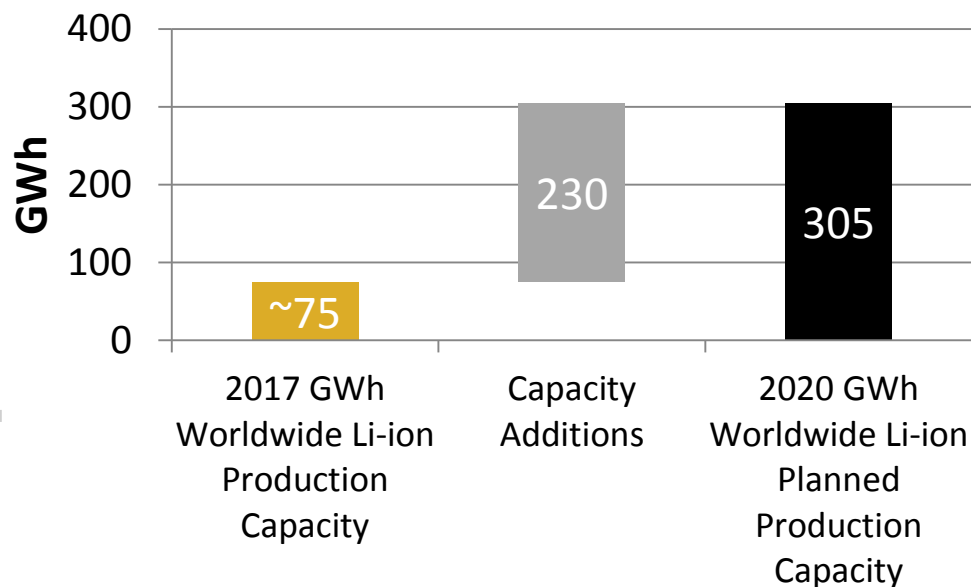


- With the portable electronics market at saturation, growth is being delivered by automotive, ESS and power devices segments
- The automotive market's lithium consumption is being enhanced by declining costs (currently **~US\$220/Kwh** heading toward **US\$150/Kwh**) and a move to bigger batteries
- EV growth rates are currently **~40%** and many expect **45-50%** may be reached by 2020
- ESS growth rates **~25%** and accelerating
- Battery lithium consumption (kg per kWh steadily declining 1kg > 0.8kg and possibly to 0.6kg

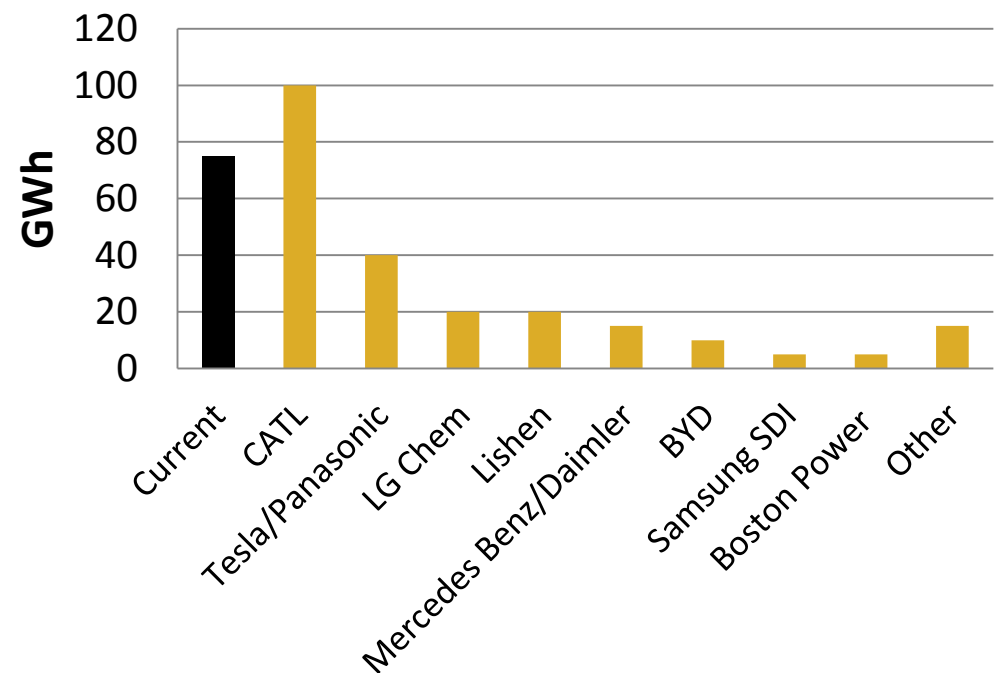
BATTERY MANUFACTURING CAPACITY COULD QUADRUPLE BY 2020

- ~230 GWh of capacity additions are expected from 15-20 battery facilities at a cost of ~US\$10 billion*
- BUT it could be even higher e.g. newcomer Energy Absolute recently proposed building a battery factory that will be scaled up to 50 GWh by 2020 at a total investment of US\$2.9 billion dependent on demand

2017 to 2020 Global Li-ion Production Capacity (GWh)



Li-ion Battery Capacity Expansions by 2020 (GWh)

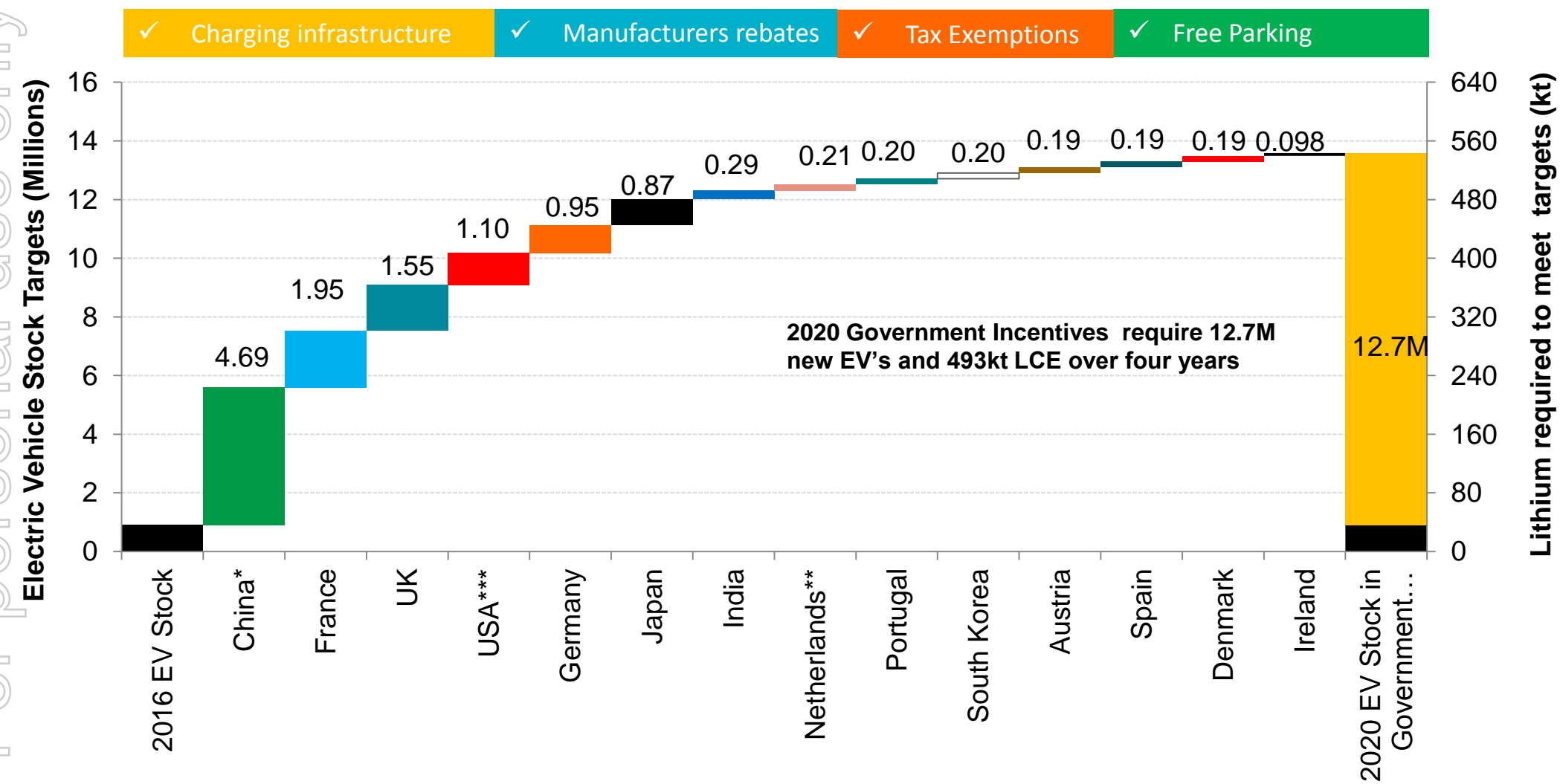


Sources: Benchmark Minerals, Lux Research, Bloomberg

*Capital spend for some facilities is not available

Capital per GWh capacity calculation using Panasonic Dalian 2017 build example – US\$40M for ~5 GWh = US\$8M per GWh

GOVERNMENT MANDATES WILL PROVIDE SUPPORT FOR CONTINUED GROWTH IN EV PENETRATION RATES

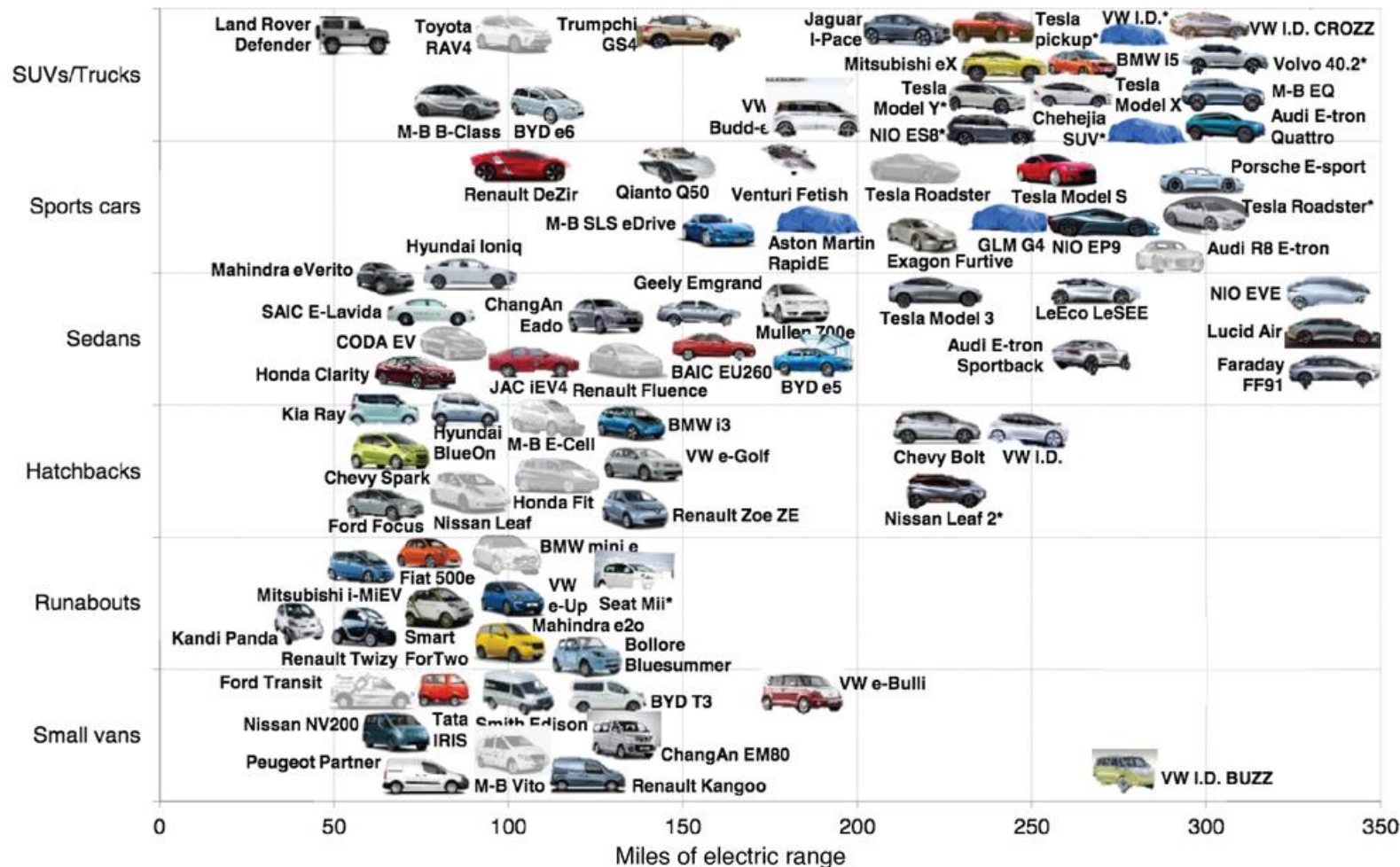


Source: International Energy Agency Global Outlook 2016
* This target includes 4.3 million cars and 0.3 million taxis and is part of an overall deployment target of 5 million cars, taxis, buses and special vehicles by 2020 (EVI, 2016b)
** Estimate based on a 10% market share target by 2020
*** Estimate based on the achievement of the 3.3 million EV target announced to 2025 in eight US states which are assumed to account for 25% of the US car market
LCE required: assumes 50kWh per EV unit; 0.8kg per kwh

OVER 120 DIFFERENT EV MODELS ARE EXPECTED BY 2020

Electric-Car Boom

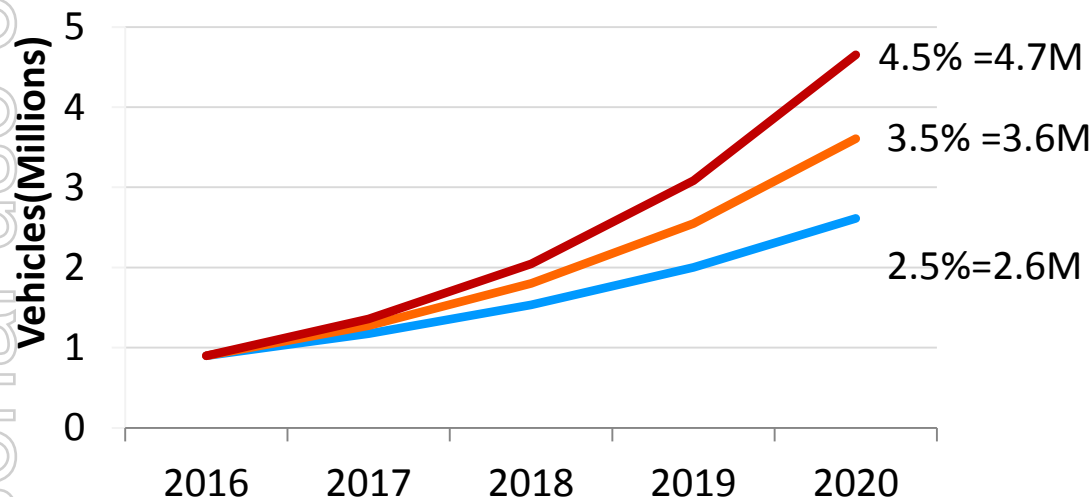
Models by style and range available through 2020



Sources: Bloomberg

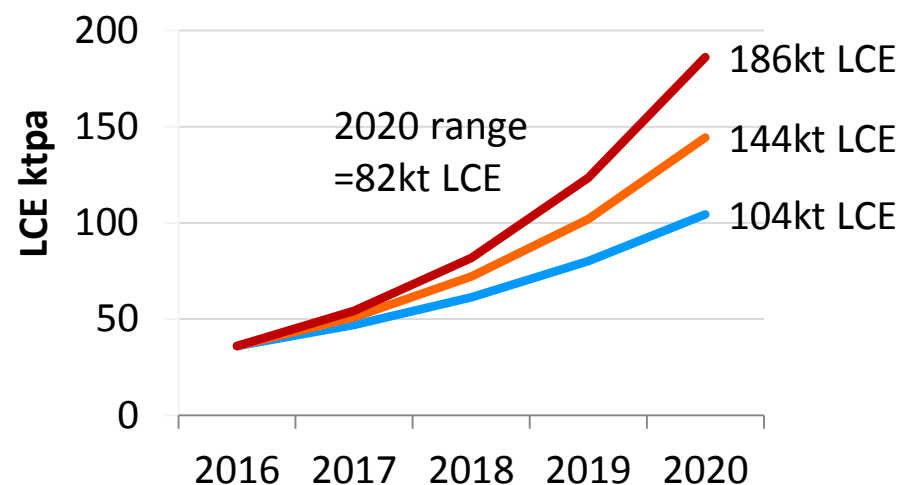
VIEWS ON EV PENETRATION RATES PROVIDE UNCERTAINTY IN LCE DEMAND GROWTH

EV Sales Units (Millions) with various EV Penetration rates



- At the current growth rate, EV penetration will reach 3.4% by 2020 and equate to 3.5M EV's.
- An EV penetration of 2.5% in 2020 would represent a deceleration in growth
- The difference between a optimistic (4.5%) and pessimistic (2.5%) view is 82kt LCE lithium demand by 2020

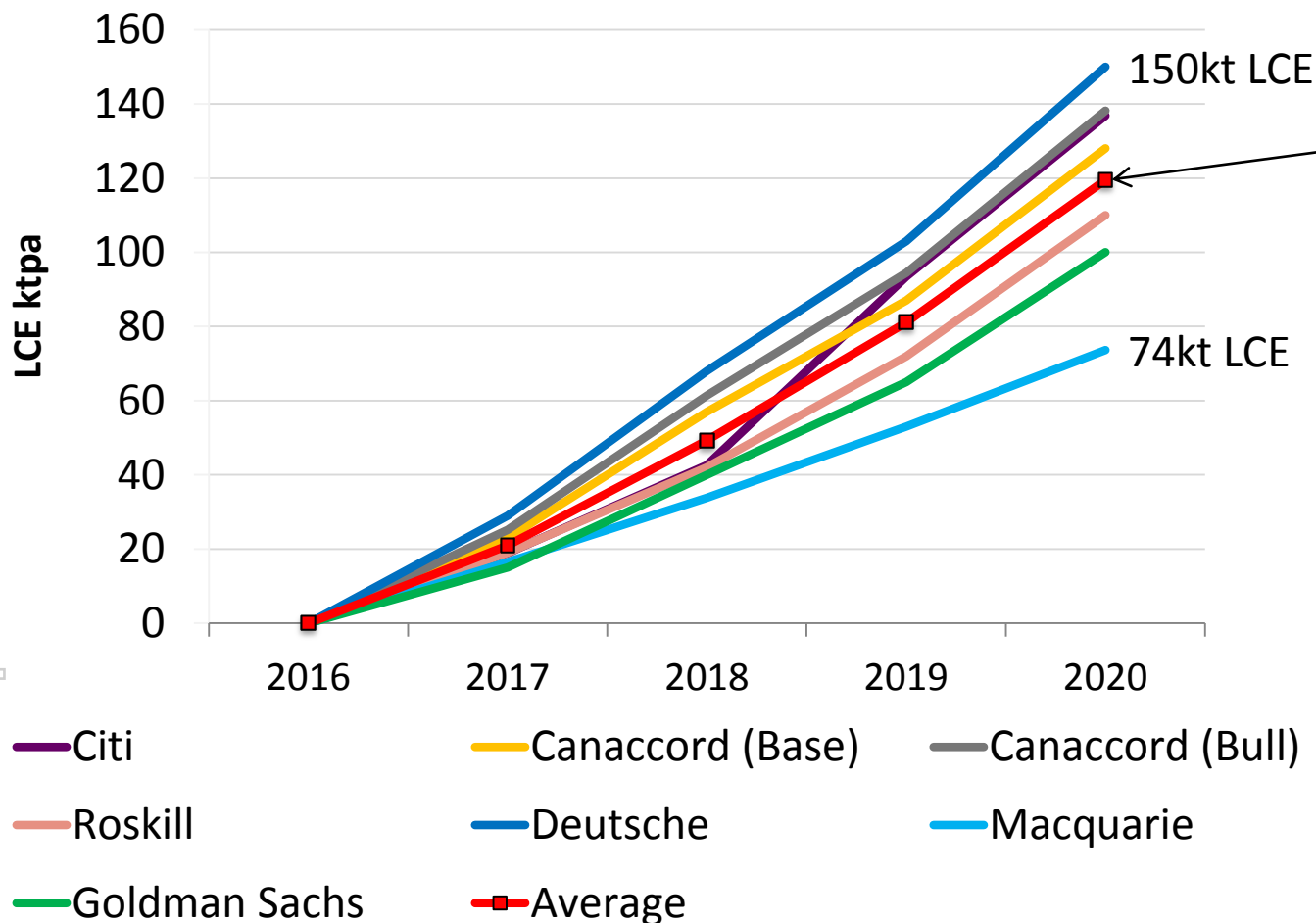
Lithium Demand (LCE ktpa) with various EV Penetration rates



- Pessimistic: EV Penetration 2.5% by 2020
- Current Demand Profile: EV Penetration 3.5% by 2020
- Optimistic: EV Penetration 4.5% by 2020

ANALYSTS FORECAST A RANGE OF OUTCOMES

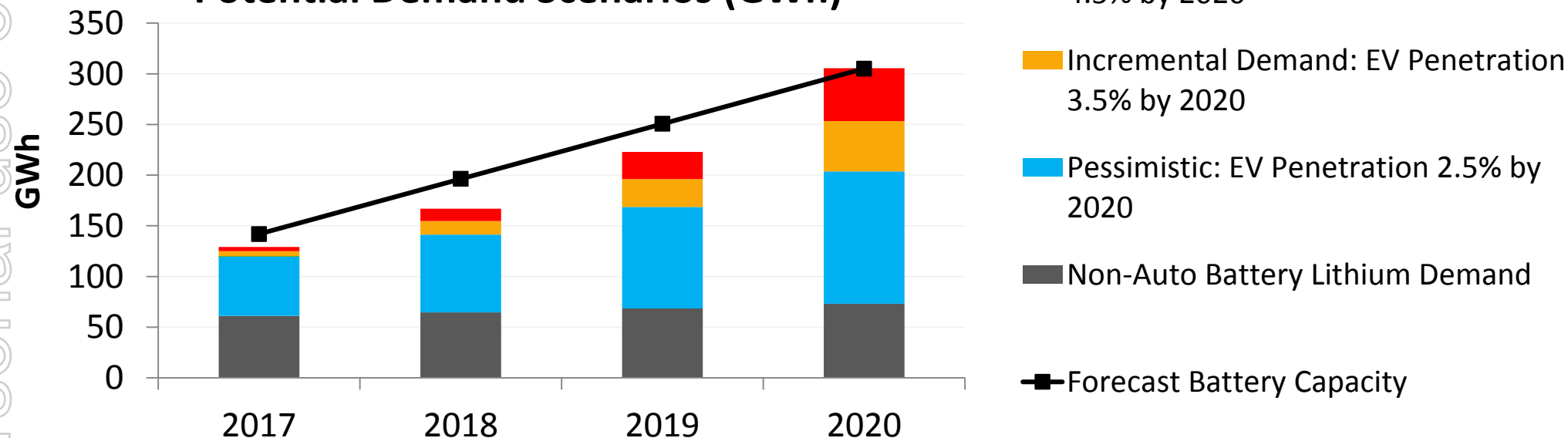
Normalised Growth of
Lithium Demand (LCE ktpa)



- The average forecast demand growth from 2016 to 2020 is **120kt LCE** but forecasts vary by as much as 76kt LCE in 2020
- This figure correlates well, although slightly lower, that 3.5% EV penetration in 2020 allowing for ~20kt LCE in other area.
- Analysts revising forecasts upwards?

WILL WE HAVE SUFFICIENT BATTERY CAPACITY?

Battery Capacity & Potential Demand Scenarios (GWh)



- EV growth rates are currently ~40% which would result in a 3.4% EV penetration rate by 2020, however a growing number of industry participants believe penetration rates of at least 4.5% are possible given recent momentum and support e.g. Government subsidies and policies, lowering costs, growing range of EV models available to consumers
- However, any growth above 4.5% EV penetration OR further upside to ESS growth (>30%) would require battery capacity above the current forecasted ~305 GWh figure.

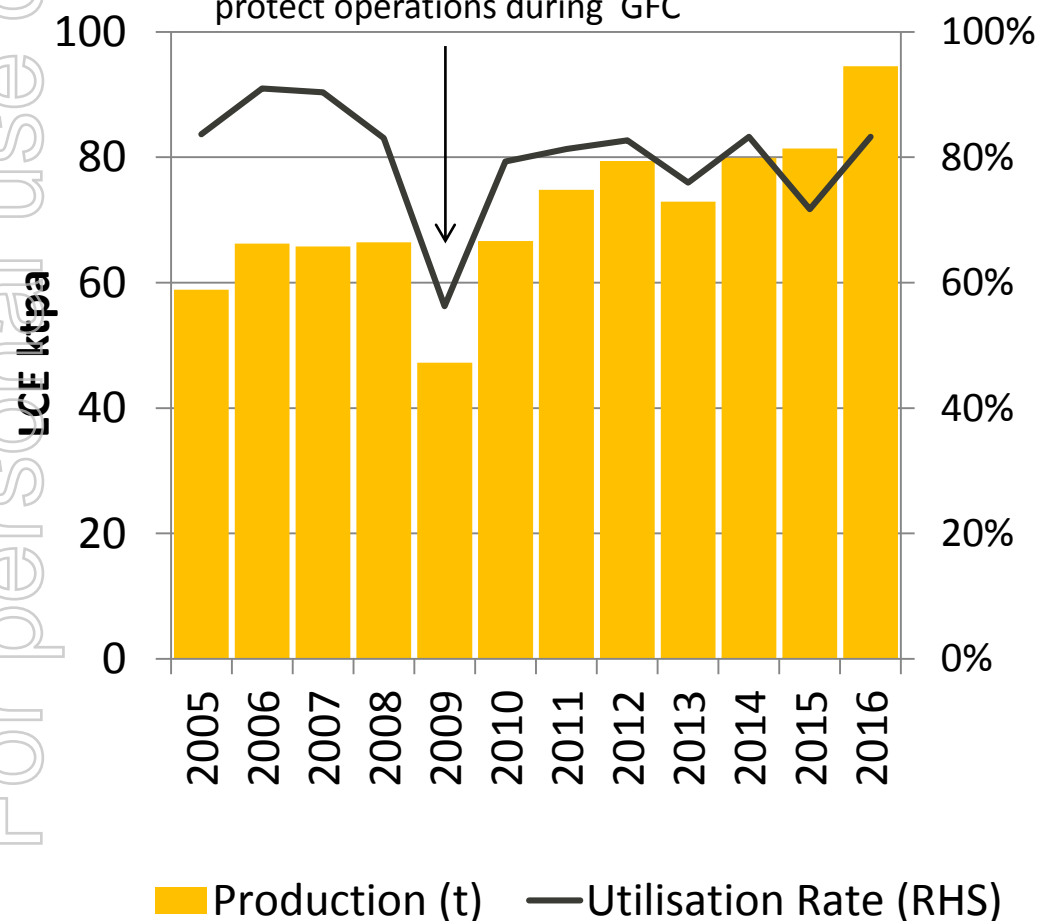
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SUPPLY

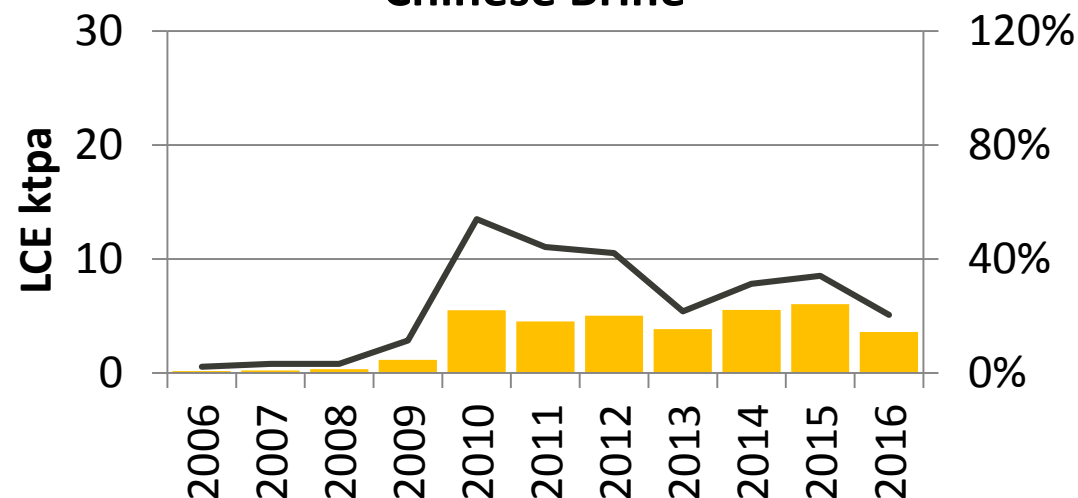
OVERSTATED CAPACITIES HAVE DISTORTED PERCEPTIONS

Ex-China Brine

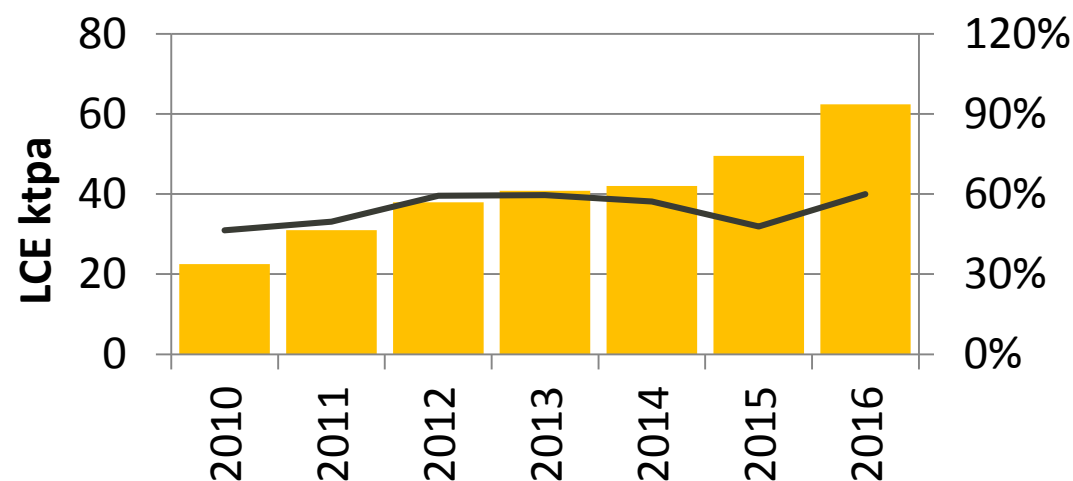
Brine operators moderate production to protect operations during GFC



Chinese Brine

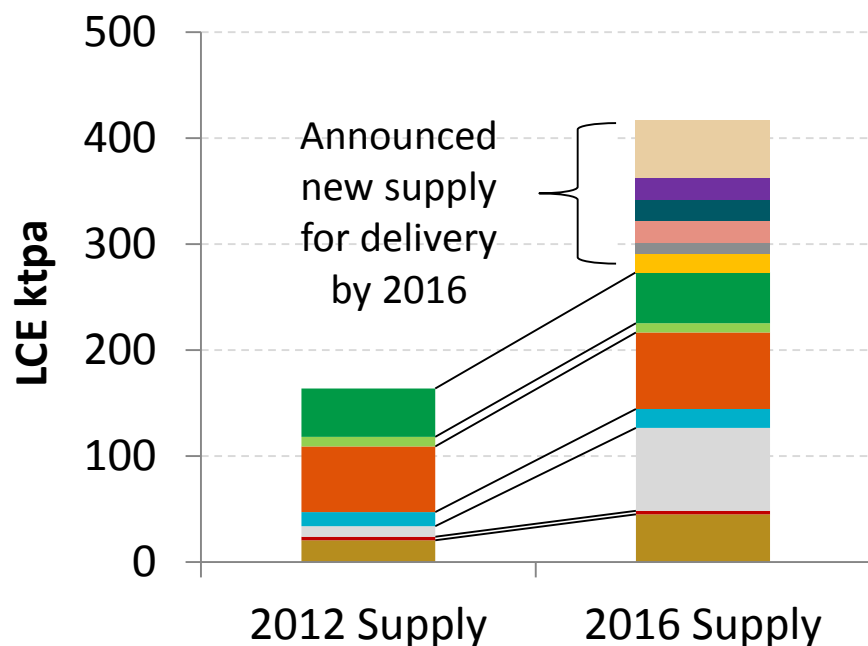


Chinese Spodumene Conversion

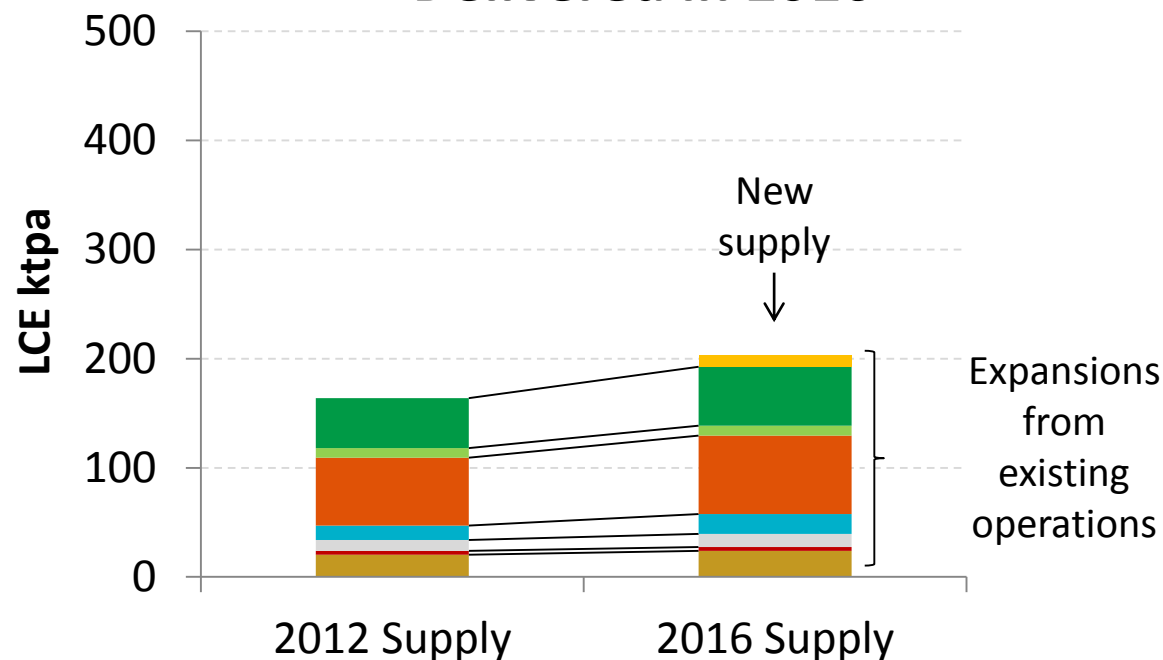


WHAT IS EXPECTED IS NOT ALWAYS DELIVERED

Planned in 2012



Delivered in 2016



ALB Atacama

ALB Silver Peak

Chinese Brine & Mineral

FMC Hombre Muerto

Greenbushes, WA

Other Mineral

SQM Atacama

Olaroz

Salar del Rincón

Quebec Lithium

ALB La Negra 2

Mt Cattlin

Mt Marion

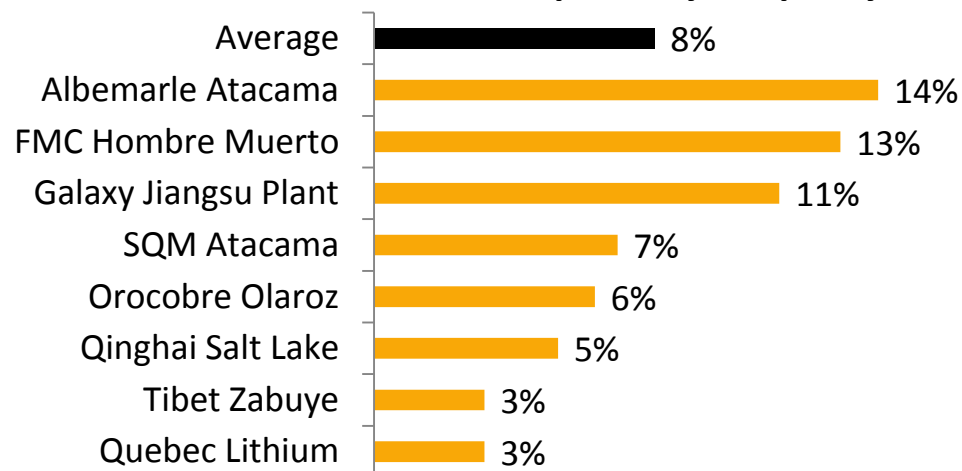
PROJECTS DELAYED OR HAVEN'T REACHED CAPACITY

Company	Operation	Targeted Capacity	Targeted Completion	Project Status	2016 Estimated Supply
FMC	Hombre Muerto	23000	2013	Added but not fully utilised	18000
Energi	Salar del Rincón	10000	...	Exploration	-
Quebec Lithium	Quebec Lithium	21000	2013	Closed	-
Tibet Lithium	Zabuye	18000	2013	Not complete or being utilised	1500
CITIC Guoan	West Taijinar	30000	2014	Not complete or being utilised, changed owners	-
Qinghai Salt Lake	East Taijinaier	17000	2014-2016	Not complete or being utilised	100
Qinghai Lanke	Chaerhan	17000	2014	Not complete or being utilised	1400
Galaxy	Mt Cattlin	20600	2016	Shipped 2017	-
Neometals	Mt Marion	54000	2016	Shipped 2017	-
Albemarle	Salar de Atacama	45000	2013	Capacity Partly added; Still constructing	24000
Orocobre	Olaroz	17500	2015	Completed 2015 & Ramping up	10500
TOTAL		273,100			55,500

PRODUCTION RAMP UP PROFILES ARE SLOW

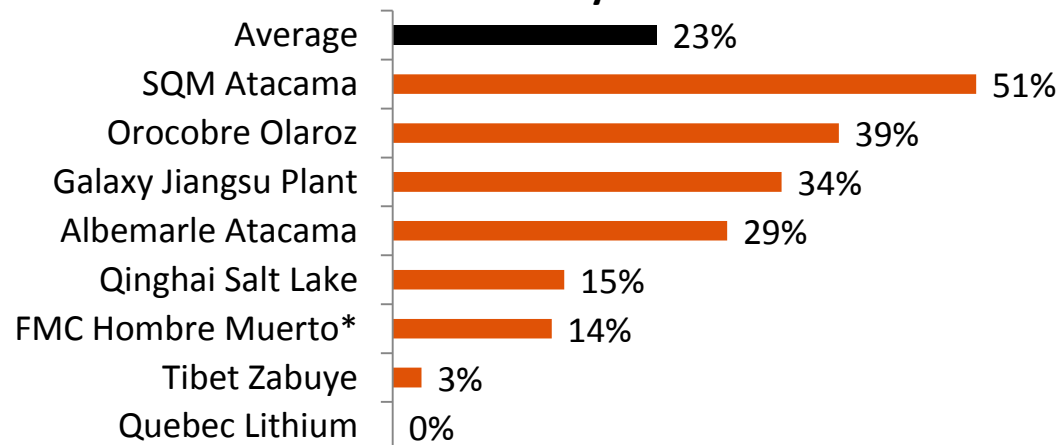
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First reported year/part year

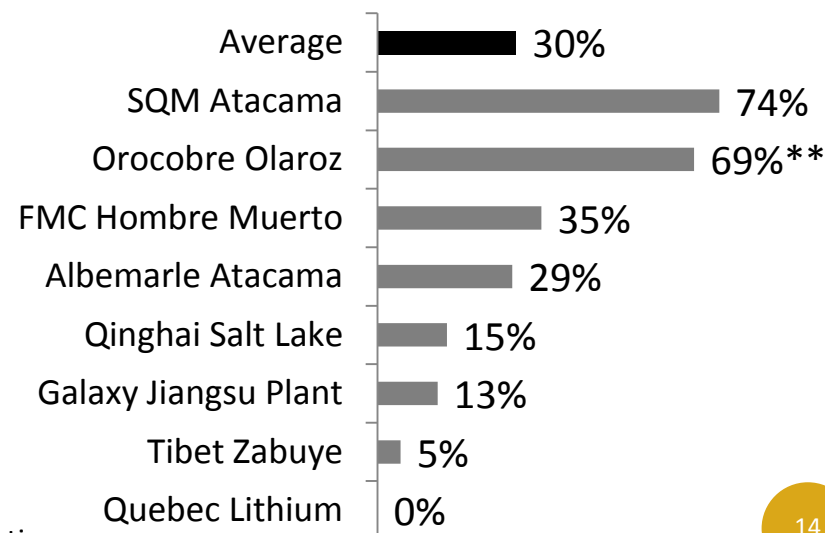


- History shows that all projects take time to ramp up
- Each operation has a unique set of technical, operational, and financial variables impacting ramp up
- Skill set is not widespread

Second year



Third year



*FMC Hombre Muerto carbonate production line ceased production

**Based on lower range of expected production range in FY17 (12-12.5kt)

Sources: Company Reports, USGS, Roskill

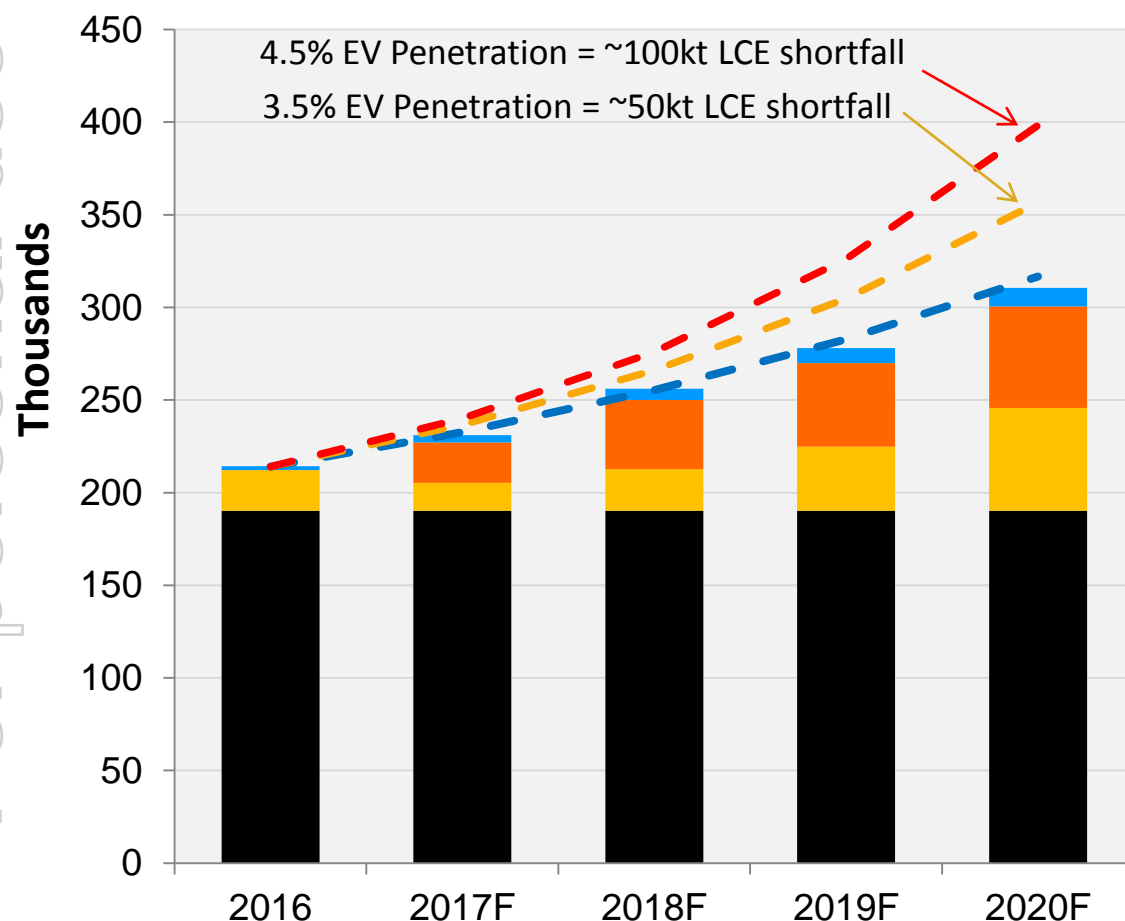
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SUPPLY DEMAND BALANCE



NEW SUPPLY WILL BE REQUIRED TO MEET THE CURRENT GROWTH RATES IN EV DEMAND

Orocobre View of Lithium Supply and Demand LCE tpa

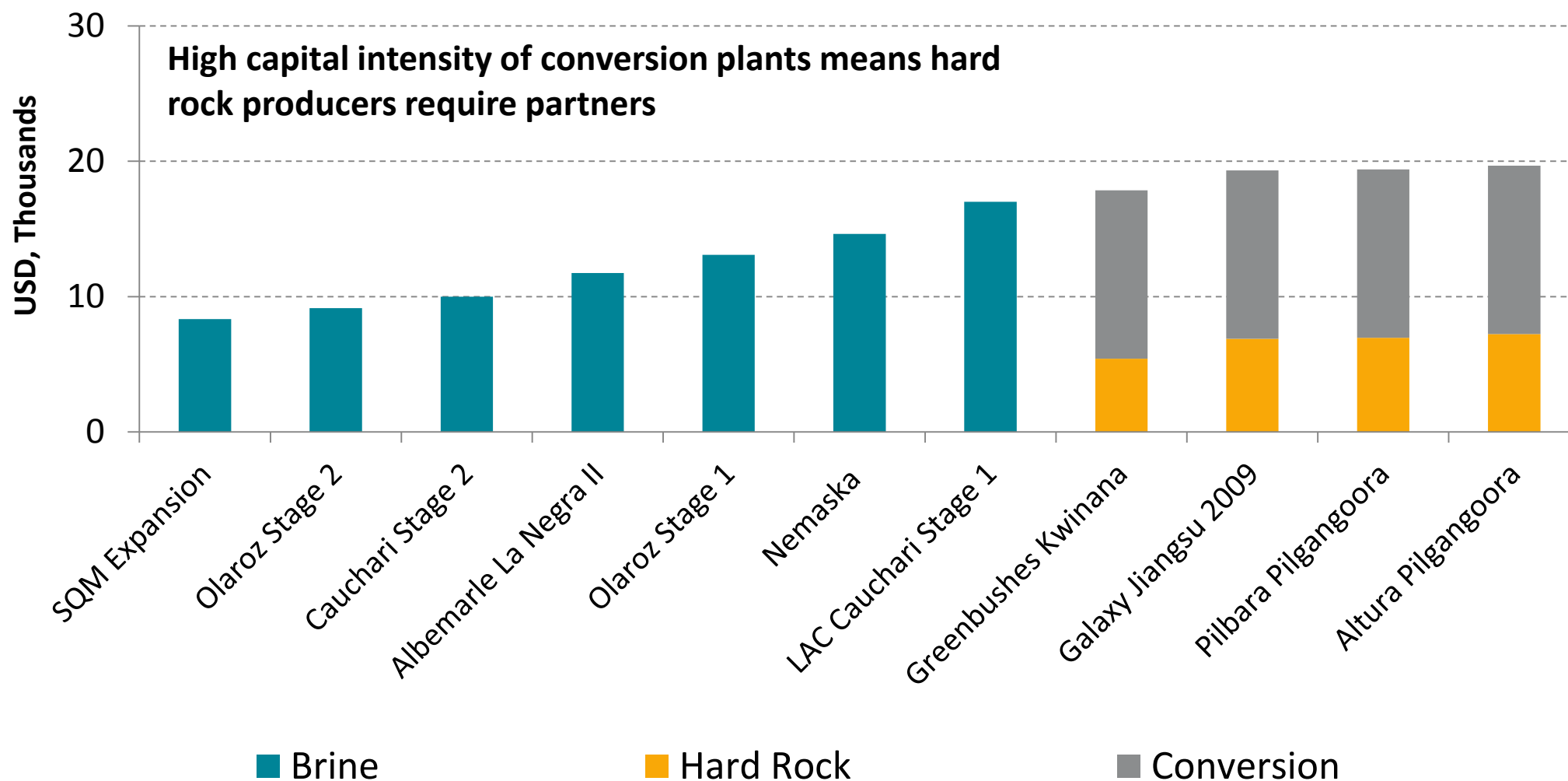


- Ramping Up Chinese Brine
- Ramping Up Western Hard Rock + Conversion
- Western Brine
- Existing Capacity at Utilisation (85% ex-China; 60% China)
- Pessimistic: 2.5% Penetration, ~30% growth in EV's, 30% growth in ESS
- Current Demand Profile: 3.5% Penetration, ~40% growth in EV's, 30% growth in ESS
- Optimistic: 4.5% Penetration, ~50% growth in EV's, 30% growth in ESS

PARTNERSHIPS & CONSOLIDATION



CAPITAL INTENSITY – THE HURDLE FOR NEWCOMERS



Sources: Company Reports, Analyst Reports, Independent Research

Spodumene assets include conversion plant capital and conversion to LCE costs

Conversion plant capital utilises Kwinana DFS CAPEX A\$398M for 24kt plant

= US\$12,438 capital per tonne of conversion capacity required, converted at AUDUSD = 0.75

Brine includes expansion to ponds

FUNDING CAPITAL-HUNGRY LITHIUM PROJECTS IS CHALLENGING

- Lithium is not an LME traded commodity
- Customers require qualified product
- Operations are bespoke
- Technology is held by incumbents
- Greenfield developments are inherently high risk
- Below expectation ramp-up performance experienced in brine operations, hard rock mines and conversion plants increases funding risk for debt and equity
- Technical skills required for integrated concentrate and conversion projects are beyond those normally found in either resource or conversion companies
- Brine does not naturally fit either in chemicals sector or mining experiences



Junior companies need partners or politically supported financing

FUNDING PARTNERSHIP DEALS ARE BEING ESTABLISHED BUT SLOWLY

Well established partnerships :

- Orocobre and TTC
- Neometals with Mineral Resources and Ganfeng
- LAC with SQM



New partnerships developing:

- LAC with Ganfeng and Bangchak
- Pilbara and Ganfeng
- Pilbara and General Lithium



But not all partnerships survive:

- LAC with Mitsubishi and Magma Corp
- Galaxy with KORES



Partnerships are part of the new norm for non-established producers

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EXPANSION ASPIRATIONS



EXISTING PRODUCERS RESPONDING TO DEMAND

SQM

- Will increase capacity by 15ktpa LCE to 63ktpa
- Expects demand to grow 14% YoY in 2017

FMC

- Will triple lithium hydroxide capacity
- Will add 20ktpa LCE hydroxide capacity each year

Tianqi

- Will increase conversion capacity by ~70% with the construction of the A\$398M Kwinana plant

Albermarle

- *“lithium demand will rise 35ktpa for the next 5 years”*
- *“want 50% of new growth”*

Ganfeng

- *“will build another 20ktpa hydroxide plant by early 2018”*
- *“just added a further 15ktpa carbonate capacity”*

INCUMBENTS HAVE SIGNIFICANT ADVANTAGES

- Lower capital intensity
- Existing operations with knowledge of production processes and understanding of technology
- Production scale to protect unit costs
- Existing infrastructure, workforce and supply chains
- A relationship with regulators and familiarity with local laws
- Established markets
- Lower capital intensity
- Shorter time to delivery
- Access to finance



CONCLUSIONS



SUMMARY

- Strong growth in demand but uncertainty on how strong
- New developments are needed to meet >2.5% EV penetration in 2020
- There are projects in the pipeline but supply response will be slower than desired
- Financing projects is challenging and juniors need partners
- Established producers rising to the challenge but response will take time
- Market conditions to stay tight, if not undersupplied, to 2020

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