

# Syrah Resources

Benchmark Minerals Intelligence, Graphite and Anodes Conference, October 2018

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# Syrah is strongly positioned to grow shareholder value as the world's largest natural graphite supplier

- 1 Global mega trend, the decarbonisation of economic growth continues, despite short term politics**
  - Decarbonisation of the transport sector, via lithium ion powered electric vehicles (EV), is gaining momentum
- 2 Demand for natural graphite is in growth phase to support the manufacturing of lithium ion batteries**
  - Market transition toward greater value for fines underway
- 3 Syrah has built, commissioned and is now operating the largest natural graphite mine in the world**
  - Establishing position as key exporter of natural graphite globally, and first major exporter to China
- 4 Supply of natural graphite market is in a phase of disruption as Syrah Resources ramps up**
  - Increasing demand for Syrah material, particularly in China expected to drive greater contract volumes
- 5 Production of spherical products outside of China is strategically important for the EV supply chain**
  - Major environmental and cost advantage of starting with a higher grade fines product



## Syrah Resources





## Balama flyover



# Positive underlying progress overshadowed by first year ramp-up issues

## Balama Progress

- Primary Classifier timing for **repair on track**
- Excellent Health and Safety results **TRIFR = 1.0**
- Implementing strong processes & **operating discipline**
- 2018 Production **>70,000t** YTD, expected **>100,000mt**
- Average ore grade presenting Q3 – **16%**
- Average finished product grade in Q3 – **96% FC**; low impurities
- Attrition cells operational, initial trials **98% FC product**; flotation produced (non-acid purified)
- Increased large flake **+50 and +80 mesh production**
- Logistics improvement and **inventory drawdown**

## Market Progress

- Syrah's ramp up profile initially impacted contract volumes
- Battery and industrial market **qualification achieved**
- Sales contract volumes & **demand increasing**
- Disruption of traditional market trade flows
- Product mix, grade and quality **improving price realisation**
- Grade **price differentials demonstrated** (value-in-use)
- **Environmental value** of higher grade product evident
- **Market in transition** toward greater value for fines



# Syrah Resources is leveraging the Balama asset to develop integrated battery and industrial material options – BAM and Vanadium

## Multi-generation asset

Over 50 year mine life<sup>1</sup>  
High grade, low  
impurity, highly  
consistent product

## One of the largest graphite mines in the world

350ktpa<sup>1</sup> capacity,  
multiple times larger  
than other mines

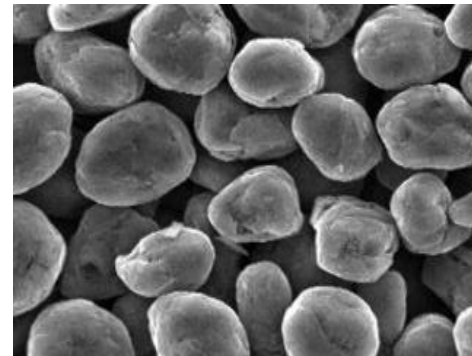
## Downstream Strategy

Production of Battery  
Anode Material (BAM)  
in USA



## Option Value

Expansion of Balama  
and processing  
vanadium (currently  
reporting to tailings)  
potential<sup>3</sup>



## Key Supplier

Sales into battery and  
steel markets achieved;  
  
Major seller into China;  
a net exporter

- (1) Refer to ASX announcements titled "Syrah finalises Balama Graphite study and declares maiden Ore Reserve" released on 29 May 2015, "Syrah increases Balama Reserves and awards Laboratory Contract" released on 15 November 2016. All material assumptions underpinning the production target in these announcements continue to apply and have not materially changed other than as updated in subsequent ASX announcements. Life of mine based on current 114.5Mt Graphite Ore Reserves being depleted at 2Mt of mill throughput per annum.
- (3) Scoping study on potential to refine vanadium as per the ASX announcement dated 30 July 2014.



**SYRAH RESOURCES**



# Syrah is one of the largest resource sector employers in Mozambique and is having a meaningful and positive impact in the country

## Supporting the Economy

>US\$30 million in salaries and taxes paid in Mozambique to date

## Employment

~1,400 direct and contract roles for Mozambicans

## Health & Community

Programs to improve education, health and skills training facilities

## Environment

World class environmental protection plan



Education and health funding



High skilled jobs



Skills training centre



Agricultural improvement program





# Balama is a strategic asset for both the graphite and battery industries

## Commodity

Flake Graphite

Copper

Iron Ore

Zinc



## Largest mine

**Balama**  
Mozambique

**Escondida**  
Chile

**S11D (Carajas)**  
Brazil

**Rampura Agucha**  
India



## Market share

~15% in 2018<sup>1</sup>  
35 – 40% at full capacity<sup>1</sup>

~5% in 2017

~5% at full capacity

~5% in 2017

Source: Syrah Resources, CRU, Wood Mackenzie

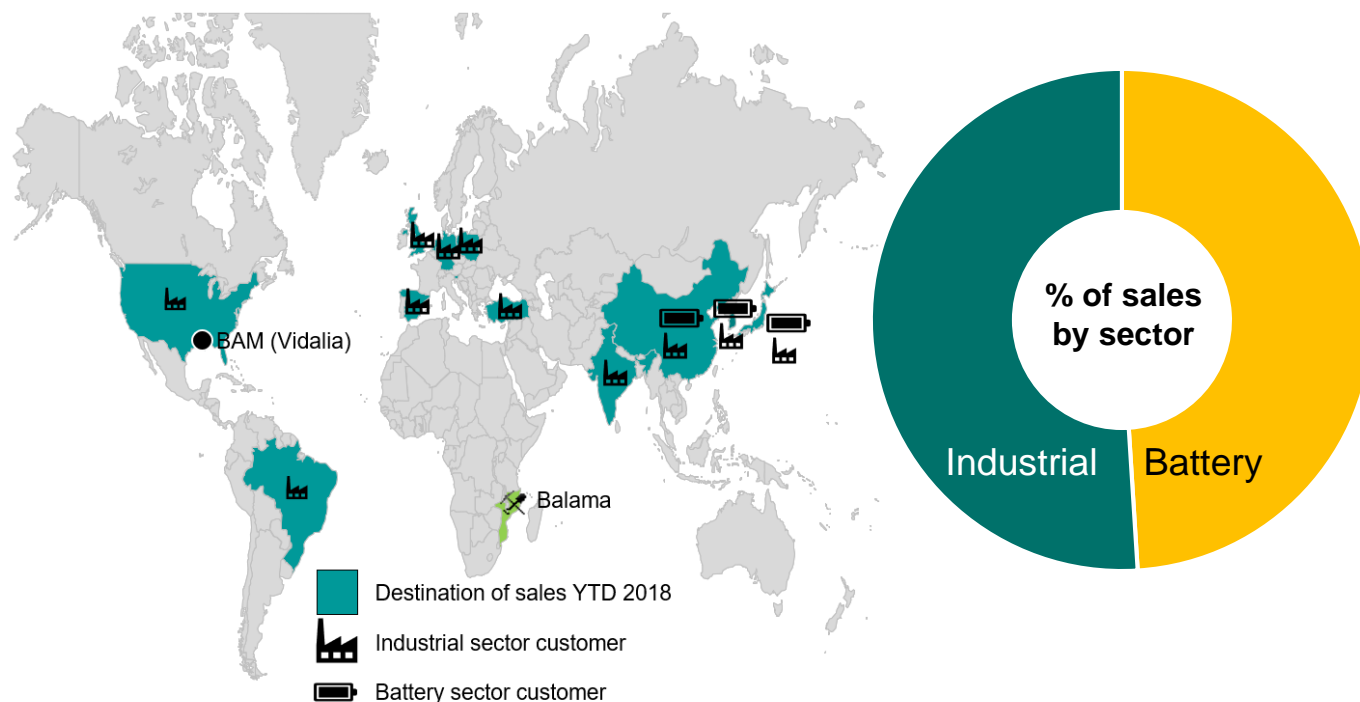
(1) Based on FY18 production target 101kt to 106kt, 350ktpa capacity and page 6 footnote 1



**SYRAH RESOURCES**

# Syrah's diversification of customers across country, market sector and contract type provides regular and global price discovery

## Sectorial and Geographical Sales Diversification



## Global Price Discovery

| Country | Number of customers | Contract Type              | Pricing Mechanism          | Products <sup>(1)</sup> |
|---------|---------------------|----------------------------|----------------------------|-------------------------|
|         | 8                   | Term, Spot and Repeat Spot | Spot, quarterly and annual | Fines and Flake         |
|         | 8                   | Repeat Spot                | Spot                       | Fines and Flake         |
|         | 6                   | Term and Repeat Spot       | Spot                       | Fines and Flake         |
|         | 5                   | Term and Repeat Spot       | Fixed and Spot             | Fines and Flake         |
|         | 2                   | Term and Repeat Spot       | Fixed and Spot             | Fines and Flake         |
|         | 2                   | Repeat Spot                | Spot                       | Fines and Flake         |
|         | 1                   | Term                       | Spot                       | Fines                   |
|         | 1                   | Repeat Spot                | Spot                       | Flake                   |

Source: Syrah Resources, Sales Jan – Aug 2018, pie charts reflective of sales volumes (tonnes)

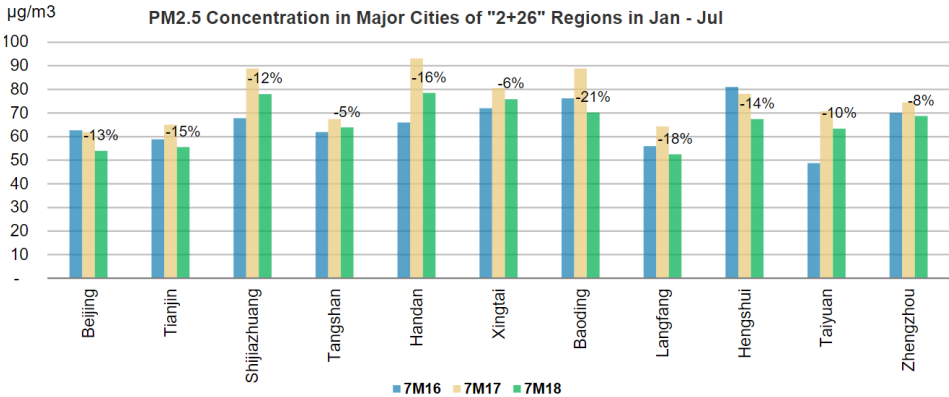
## Macro Environment and Natural Graphite Market

# Social, economic & environmental consequences of emissions a global issue

China carbon emissions in retreat after 'structural break' in economy: study

On the environment, China steps up while the US retreats

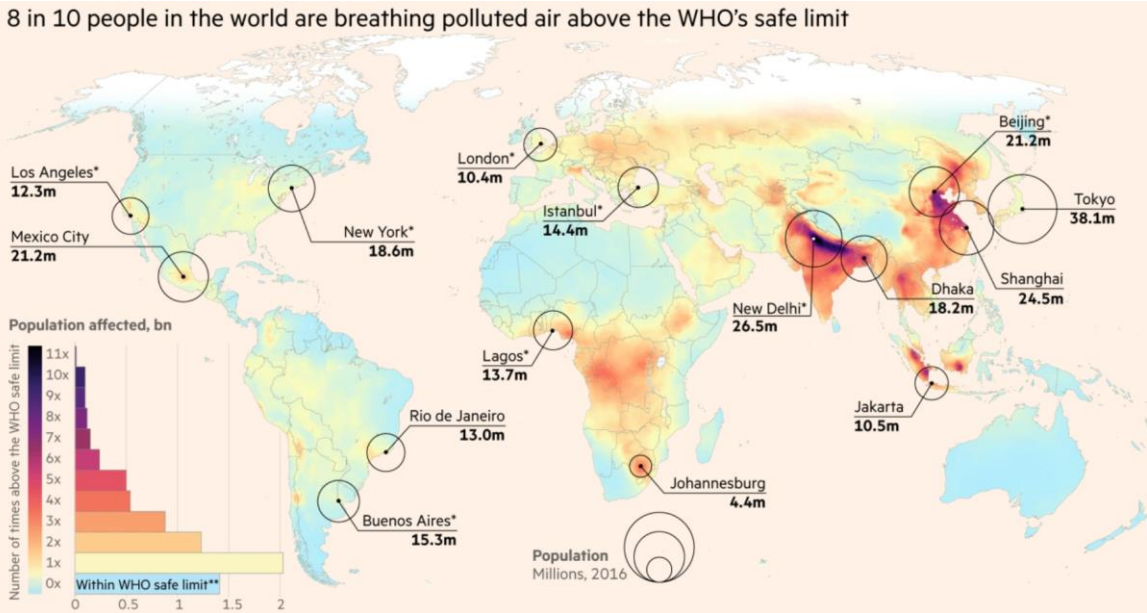
CO2 emissions cost India USD 210 billion every year: Study



Air pollution can affect your child's mental health and IQ

Airs and disgraces: how city pollution is killing residents

We must reduce greenhouse gas emissions to net zero or face more floods  
*Nicholas Stern*

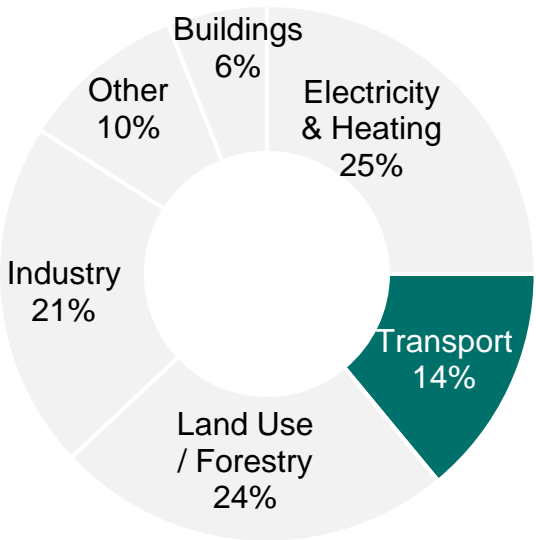


Source: NASA, Financial Times, Economic Times, Forbes, Economist, Reuters, Bloomberg, Brookings, Morgan Stanley

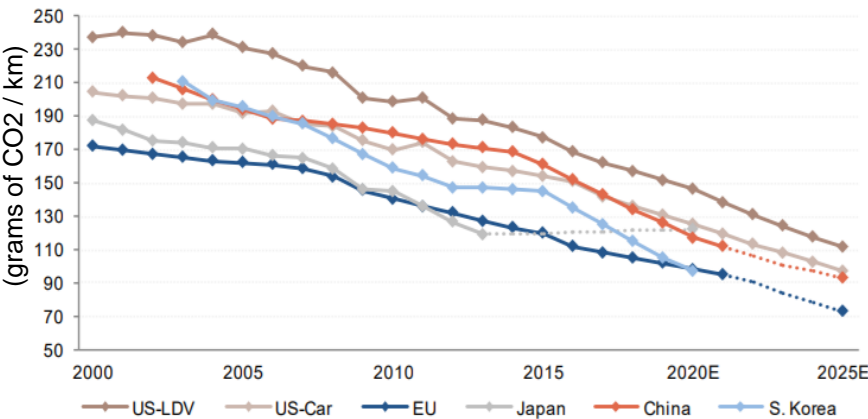


# Decarbonisation of the transport sector gaining profile and momentum

Global Carbon Emissions



Fuel Emission Standards




























Country / Regional Targets

|            |   |
|------------|---|
| China      | 10% by 2019, 12% by 2020; no post-2020 targets, but 15-20% speculated by 2025 |
| USA        | 1mn EVs by 2020      informal DoE target                                      |
| California | ZEV goal 2% by 2018, 6% by 2020, 16% by 2025                                  |
| UK         | 9% EV penetration by 2030 and a ban on new petrol and diesel cars by 2040     |
| Germany    | 1mn EVs by 2020 and 6mn EVs by 2030   |
| France     | 2mn EVs by 2020 and a ban on new petrol and diesel cars by 2040               |
| Norway     | 50,000 EVs (30%) by 2020; 100% of EVs by 2025 (not yet formalized)            |

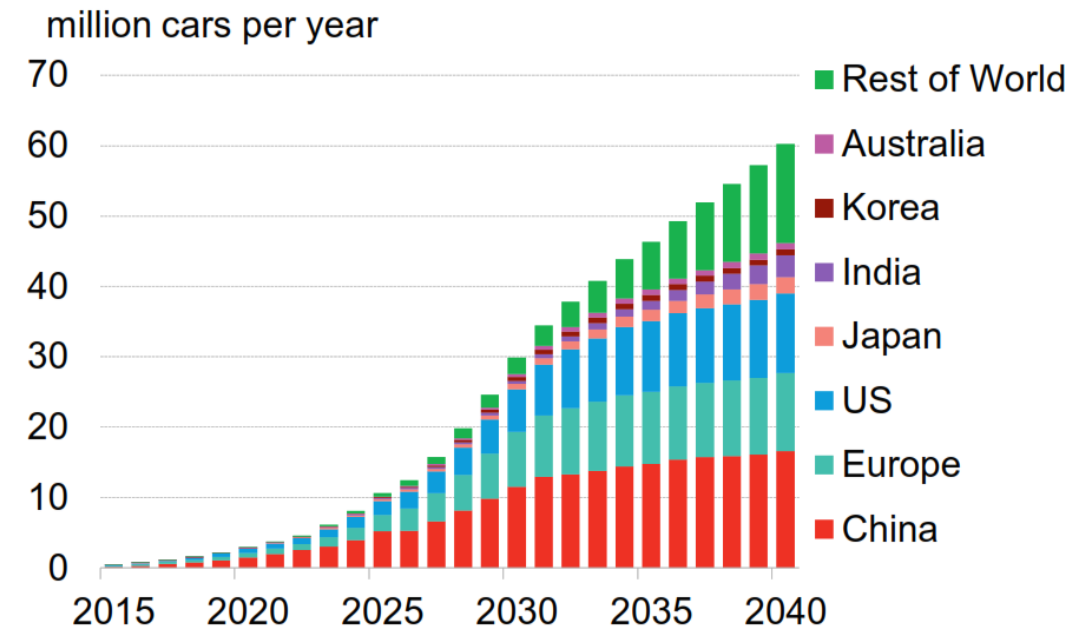
Source: United Nations Framework Convention on Climate Change, IPCC 2012, Bernstein

# Auto sector is responding to government regulation and consumer demand

| Region  | OEM   | Electric Vehicle Strategy                                       |
|---|---|---|
|    |    | 500k units in 2020, from ~100k in 2017                          |
|   |    | 500k units in 2020, no ICE engines by 2025                      |
|   |    | 600k sales by 2020  |
|   |    | 30% of fleet by 2025 (65k based on 2017 production)             |
|   |    | 60% of fleet by 2020 (185k based on 2017 production)            |
|   |    | 200k unit sales in 2020   |
|   |    | 300k unit sales by 2020, no ICE models by 2025                  |
|    |    | 600k unit sales by 2020   |
|   |    | 15-25% of fleet by 2025 (400-600k based on 2017 production)     |
|   |    | 25% of fleet by 2025 (600k based on 2017 production)            |
|   |    | 400k unit sales in China by 2020, 2-3 million globally by 2025  |
|   |    | 50% of fleet sales by 2020 (300k based on 2017 production)      |
|   |    | 80% of models to be electrified by 2023                         |
|   |   | EV models across all brands, no diesel by 2022                  |
|  |  | 1 million units p.a. by 2020                                    |
|   |  | 150k unit sales in China by 2020, 500k by 2025                  |
|   |  | 70% of China sales by 2025                                      |
|  |  | 25% of EU sales by 2020 (175k based on 2017 production)         |
|   |  | 10 new BEVs in early 2020s                                      |
|  |  | 65% of fleet sales by 2030 (3 million based on 2017 production) |
|   |   | 300k unit sales by 2020   |





































Source: Company announcements, Bloomberg New Energy Finance

Annual passenger EV sales by region

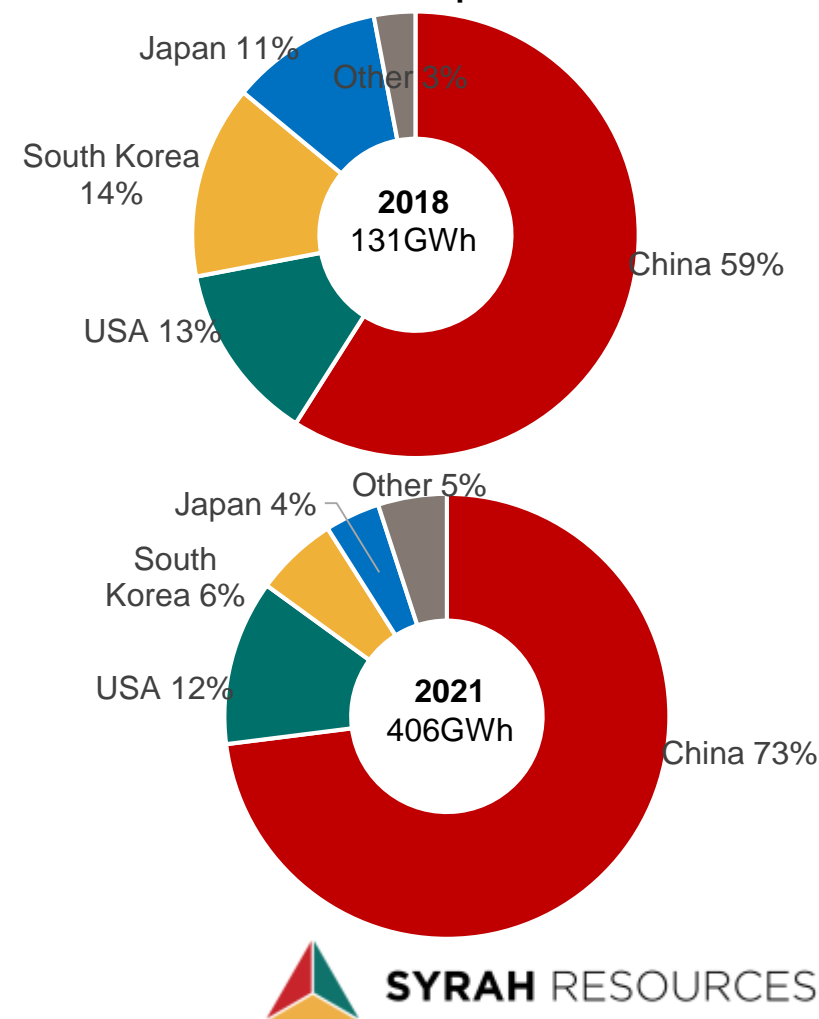


SYRAH RESOURCES

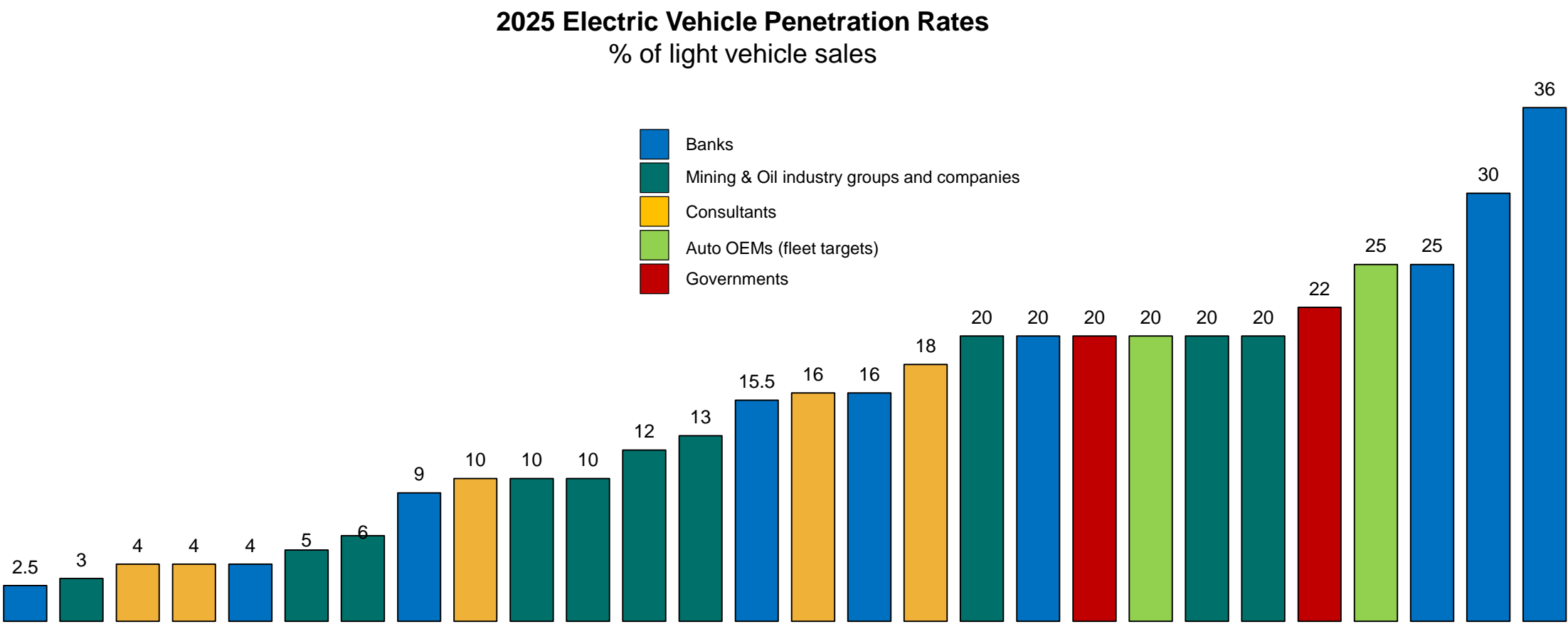
# Battery manufacturing expansion will facilitate greater EV production

| Origin  | OEM   | Electric Vehicle Batteries                                | Major Customers   |
|---|---|---|---|
|    |    | 12GWh produced in 2017, 50GWh planned by 2020             |       |
|   |    | 3.5GWh produced in 2017, 16GWh planned by 2020            |    |
|   |    | 5.5GWh current capacity, 2.5GWh planned by 2020           |       |
|   |    | 1.5GWh produced in 2017, 20GWh by 2020                    |    |
|   |    | 4GWh current capacity, 4GWh added in 2019                 |   |
|   |    | 1GWh current capacity                                     |   |
|   |    | 12GWh current capacity, targeting 20GWh by 2020           |   |
|   |    | <1GWh produced in 2017, targeting 15GWh by 2020           |   |
|   |    | <1GWh produced in 2017, targeting 15GWh by 2020           |    |
|   |    | 11GWh under construction, capacity to reach 15GWh by 2020 |    |
|  |    | 1GWh produced in 2017, 10GWh planned by 2020              |    |
|   |   | 8GWh capacity in 2017                                     |   |
|   |  | 2.5GWh produced in 2017, 20GWh planned by 2020            |   |
|   |  | 10GWh capacity in 2017, 40GWh planned by 2020             |   |
|  |  | Targeting 10GWh by 2020                                   |    |
|   |  | 10GWh produced in 2017, 50GWh capacity planned by 2020    |   |

Lithium ion battery manufacturing capacity market share for transport sector



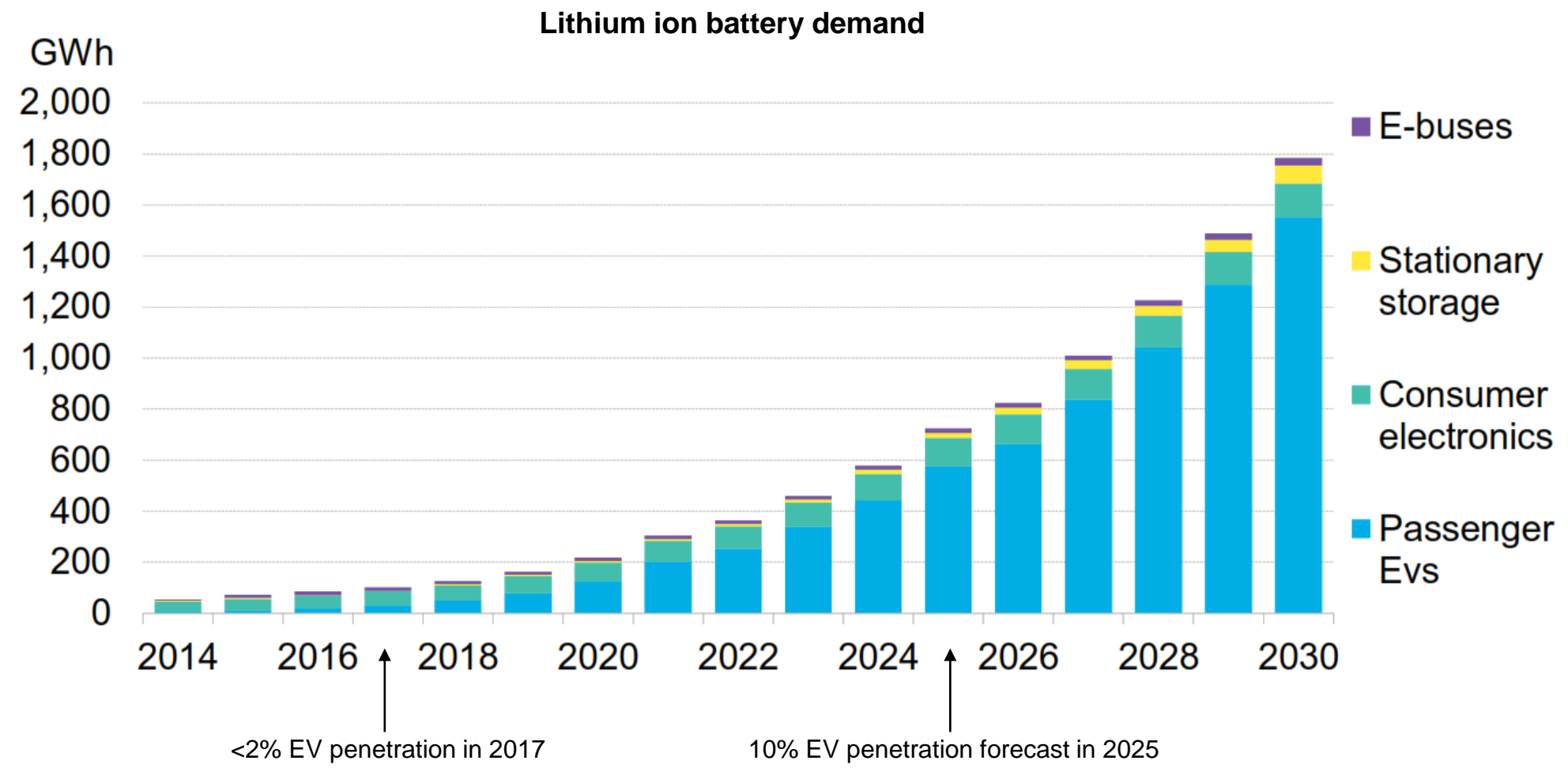
# EV penetration forecasts vary widely, but EV growth is increasing rapidly



Source: Syrah Resources, company sources and reports  
Notes: Range of forecasts include a mix of full battery electric vehicles, mild hybrids, plug in and non-plug in hybrid vehicles and low, mid and high scenarios for fleet, national and global markets

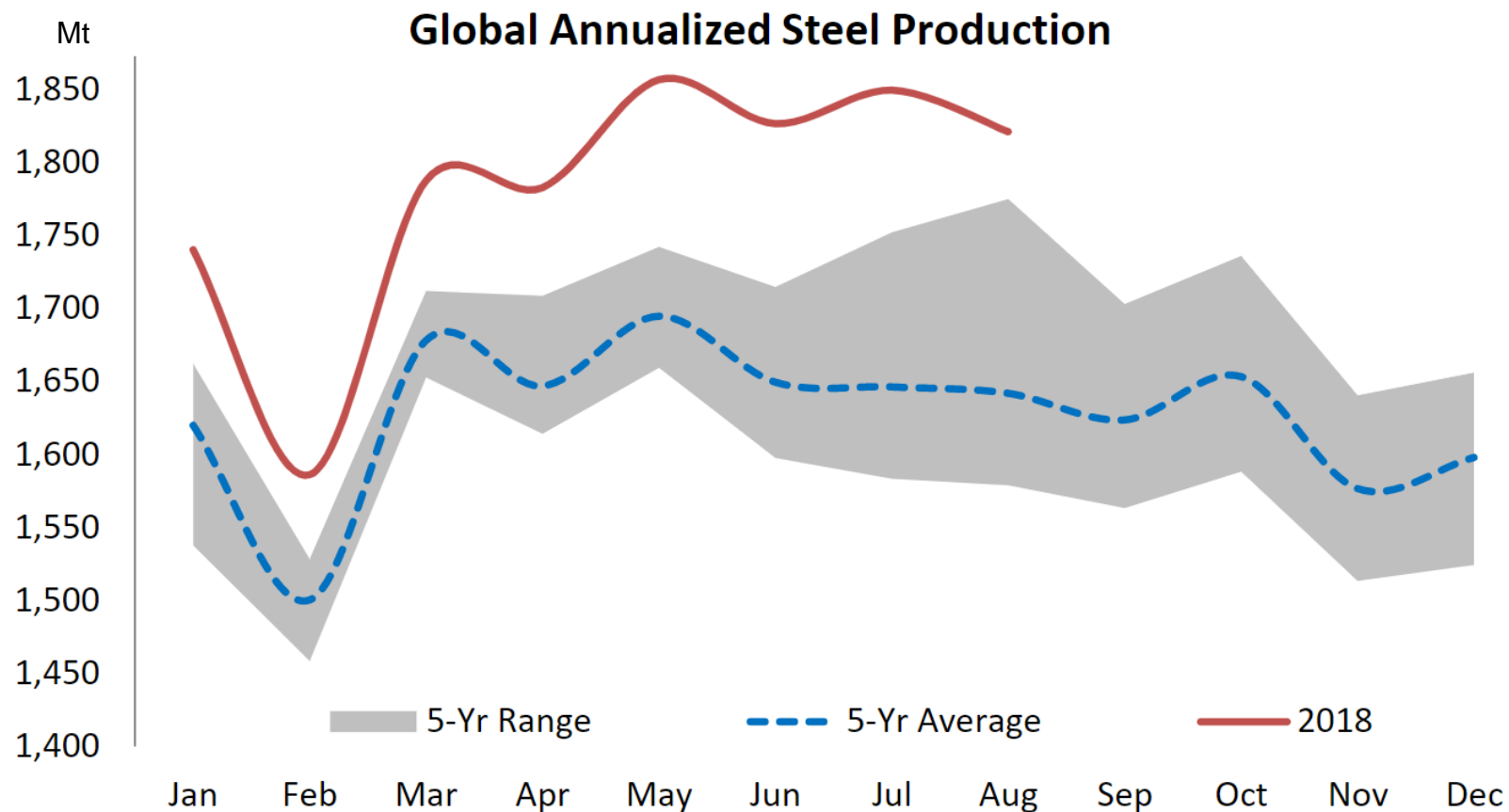


# Electric vehicles expected to be the major driver of lithium battery demand



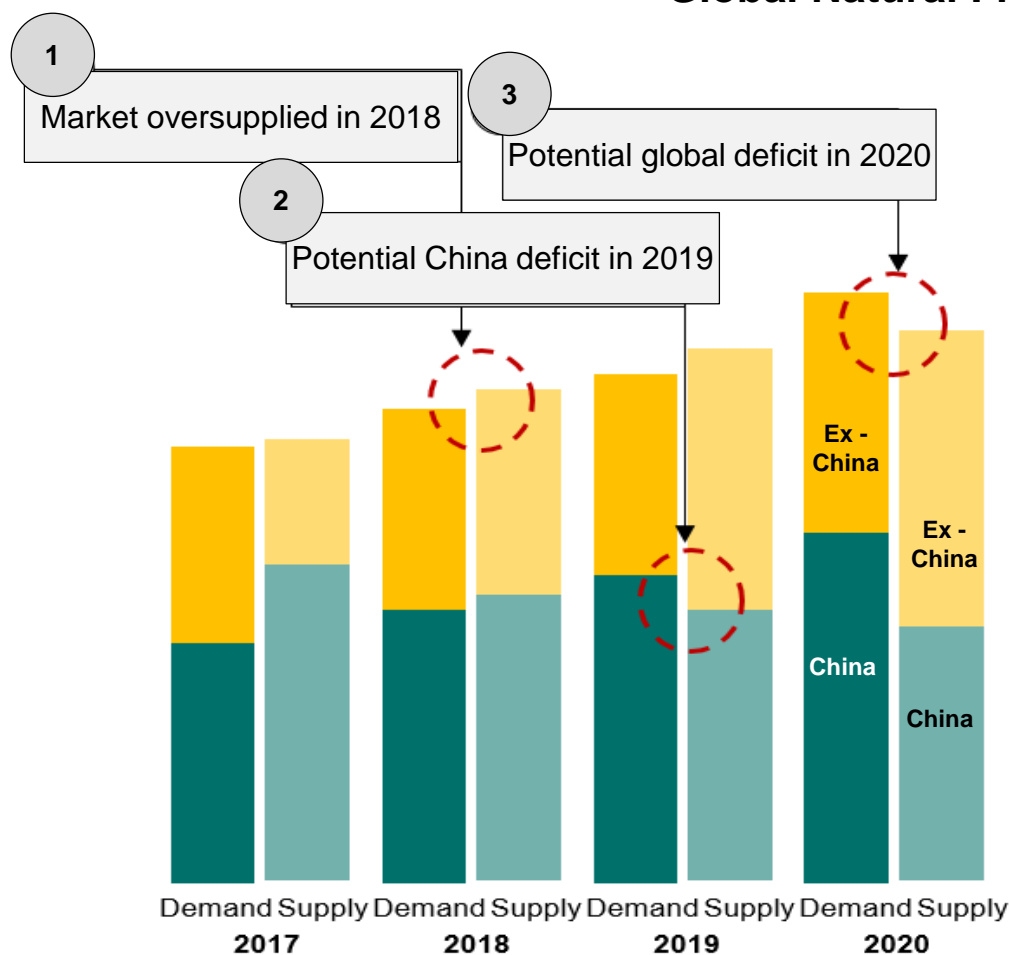
Source: Bloomberg New Energy Finance

# Steel production in 2018 has supported natural graphite demand



# Natural graphite market in structural transition, driven by battery demand

## Global Natural Flake Graphite Market



Source: Syrah Resources

### Supply

- Majority of incremental global supply is from Syrah Resources to 2020.
- China's supply is expected to rationalise due to resource depletion, grade decline and environmental pressures; before stabilising around 2020.

### Demand

- Almost all incremental demand growth comes from the lithium ion battery sector.
- Steel sector demand expected to be flat in the long run.
- Growth in applications such as expandable (flame retardant) are high value per tonne but low volume markets.

### Trade

- Global trade flows expected to structurally change as Chinese anode production grows, domestic consumption increases, and China becomes a net importer.
- Ex-China users sourcing graphite from China will require alternative sources.

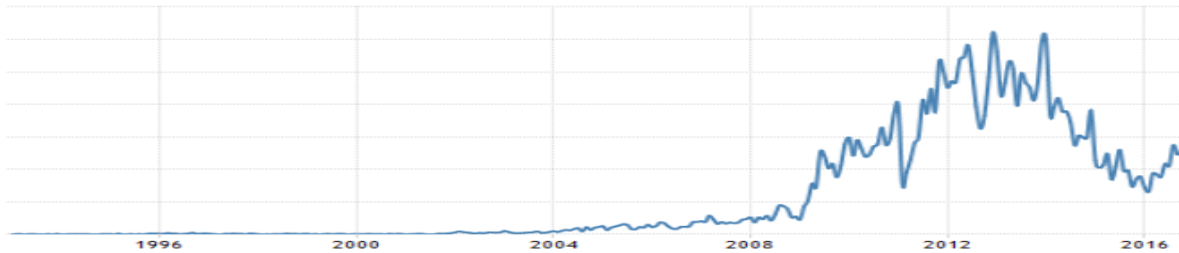
### Price

- Syrah expects China's movement from a net exporter to importer to support fines prices.

# China has structurally changed the trade flow of commodities before; natural graphite is poised to follow as China's anode production rises

## China's import of key commodities

### Thermal Coal



- ~50% of global supply, #1 global producer
- Moved from a net exporter to net importer in 2009
- **Preference for higher grade imports**

### Iron Ore



- #2/3 usable ore producer globally
- #1 importer of iron ore; volumes have grown ~300% since 2006
- **Preference for higher grade imports**

Despite having its own significant natural endowment of iron ore and coal, China has a preference for higher grade imported material.

**Syrah expects natural graphite is poised to follow this trend**



## Battery Anode Material (BAM) Development

Graphite is expected to maintain dominance in anode composition; natural graphite expected to increase market share as cost pressures increase

| Artificial Graphite<br>xEV, grid   | Natural Graphite<br>xEV, grid, portable electronics  | Silicon Alloy Anodes<br>Emerging but currently still<br>a graphite dominant mix  |
|--|--|--|
| <div>more energy</div>   |  |  |
| <div>better cycle life</div>   |  |  |
| <div>Key issues</div> <ul style="list-style-type: none"><li>• High cost</li><li>• High graphitization energy use</li></ul> <div>Mitigating solutions</div> <ul style="list-style-type: none"><li>• Mix with natural graphite</li><li>• Develop low cost graphitization</li></ul> | <div>Key issues</div> <ul style="list-style-type: none"><li>• Low temperature performance</li></ul> <div>Mitigating solutions</div> <ul style="list-style-type: none"><li>• Surface coating/modification</li></ul> | <div>Key issues</div> <ul style="list-style-type: none"><li>• Cycle life</li><li>• Electrode expansion/cell dimensional stability</li><li>• Low first cycle efficiency</li><li>• Cost</li></ul> <div>Mitigating solutions</div> <ul style="list-style-type: none"><li>• Si-nano-particles composite</li><li>• Mix with larger percentage of natural and/or artificial graphite</li><li>• Limit discharge cut-off voltage</li></ul> |

# Syrah BAM strategy underpinned by Vidalia BAM plant development; strategic opportunities to accelerate entry to final anode product market

## Strategic Context

### Rapidly evolving market

Syrah's BAM strategy reflects:

- Evolving Battery Anode Material (BAM) market
- Opportunity for accelerated final anode product entry
- Value chain relationships and potential co-operation

### Maximising Syrah's competitive advantage

- Ongoing Syrah BAM product development investment is demonstrating potential for differentiated cost and product characteristics
- Comparison performance of Syrah coated and uncoated spherical graphite shows comparable performance to existing market leading material<sup>1</sup>
- Rapid production of a BAM qualification product is critical to demonstrate quality, refine product options, accelerate strategic options and establish significant supply chain position

### Installation progress at Vidalia, Louisiana BAM facility



(1) Based on results of laboratory testing conducted by Cadenza Innovation, refer to ASX announcement dated 30 April 2018.  
(2) Plant in Louisiana will initially have 5kt per annum of milling capacity and batch scale purification capability.  
(3) Purifying can be achieved chemically or thermally. Plan for Syrah BAM plant to be capable of chemical purification.



# Syrah strongly positioned to grow shareholder value as ramp up continues and demand from lithium ion batteries increases

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  - Decarbonisation of the transport sector, via lithium ion powered electric vehicles (EV), is gaining momentum
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