

### Syrah Resources

### The changing dynamics of the graphite market

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



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



Demand for natural graphite is in growth phase to support the manufacturing of lithium ion batteries
Market transition toward greater value for fines underway



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



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



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







## **Balama flyover**







## Balama established as the largest natural graphite producer

#### **Balama Progress**

- Excellent Health and Safety results **TRIFR = 1.0**
- Implementing strong processes & **operating discipline**
- Production >70kt 9M YTD, >100kt FY18
- 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**
- Exporter of graphite to China, volumes 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



(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.





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





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





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

## % of sales by sector BAM (Vidalia) Industrial Battery Balama Destination of sales YTD 2018 ndustrial sector customer Battery sector customer

Sectorial and Geographical Sales Diversification

#### **Global Price Discovery**

Country	Number of customers	Contract Type	Pricing Mechanism	Products <sup>(1)</sup>
*)	9	Term, Spot and Repeat Spot	Spot, quarterly and annual	Fines and Flake
۲	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
<b>C</b> *	1	Repeat Spot	Spot	Flake



## **Production trials commenced to produce 98% fixed carbon product**



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Macro Environment and Natural Graphite Market



### Decarbonisation of the transport sector gaining profile and momentum

#### **Global Carbon Emissions**



#### **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)		



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### Auto sector is responding to government regulation and consumer demand



#### Annual passenger EV sales by region





Source: Company announcements, Bloomberg New Energy Finance

### Battery manufacturing expansion will facilitate greater EV production





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Source: Bernstein, Company announcements, Bloomberg New Energy Finance

## 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





### Steel production in 2018 has supported natural graphite demand





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



### **Global Natural Flake Graphite Market**

#### 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.



# Even with Syrah at full capacity, scenario analysis highlights multiple market balance outcomes; significant potential for a global deficit ~2020



#### Market Analysis

Demand scenarios driven by:

- electric car, bus, truck unit sales
- larger lithium ion batteries
- natural graphite proportion in anode
- steel sector growth

Energy storage not expected to be significant driver of demand <2021

Supply scenarios driven by:

- environmental pressure on China supply
- grade decline of China supply
- stock depletion in China

Low likelihood of new major greenfield supply before 2021; funding remains a challenge for projects under development



# 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 value of key commodities



#### Thermal Coal

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



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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 xEV, grid	Natural Graphite xEV, grid, portable electronics	Silicon Alloy Anodes Emerging but currently still a graphite dominant mix	
	more energy		
better cycle	life		
Key issues	Key issues	Key issues	
• High cost	Low temperature performance	Cycle life	
High graphitization energy use		Electrode expansion/cell	
		dimensional stability	
		Low first cycle efficiency	
		• Cost	
Mitigating solutions	Mitigating solutions	Mitigating solutions	
Mix with natural graphite	Surface coating/modification	Si-nano-particles composite	
<ul> <li>Develop low cost graphitization</li> </ul>		Mix with larger percentage of	
		natural and/or artificial graphite	
		Limit discharge cut-off voltage	





# Syrah BAM strategy underpinned by Vidalia BAM plant development; installation progressing to plan

#### **Strategic Context**

		Installation progre
	Syrah's BAM strategy reflects:	
Rapidly evolving market	<ul> <li>Evolving Battery Anode Material (BAM) market</li> <li>Opportunity for accelerated final anode product entry</li> <li>Value chain relationships and potential co-operation</li> </ul>	
	<ul> <li>Ongoing Syrah BAM product development investment is demonstrating potential for differentiated cost and product characteristics</li> </ul>	
Maximising Syrah's competitive advantage	<ul> <li>Comparison performance of Syrah coated and uncoated spherical graphite shows comparable performance to existing market leading material<sup>1</sup></li> </ul>	
	<ul> <li>Rapid production of a BAM qualification product is critical to demonstrate quality, refine product options, accelerate strategic options and establish significant supply chain position</li> </ul>	

#### Installation progress at Vidalia, Louisiana BAM facility<sup>2</sup>



Based on results of laboratory testing conducted by Cadenza Innovation, refer to ASX announcement dated 30 April 2018.
 Plant in Louisiana will initially have 5kt per annum of milling capacity and batch scale purification capability.



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



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