

### KIBARAN ESOURCES LIMITED ECOGRAF ASX: KNL FSE: FMK

BUILDING A SUSTAINABLE MATERIAL SUPPLY FOR THE EV BATTERY MARKET

Annual General Meeting - 29th Nov 2019

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Information in this presentation that relates to Exploration Results, Mineral Resources or Ore Reserves is based on information compiled by Mr Andrew Spinks, who is a Member of the Australasian Institute of Mining and Metallurgy included in a list promulgated by the ASX from time to time. Andrew Spinks is a director of Kibaran Resources Limited and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Andrew Spinks consents to the inclusion in this presentation of the matters based on his information in the form and context in which it appears.

Information in this presentation that relates to Mineral Resources is based on information compiled by Mr David Williams, a Competent Person, who is a Member of the Australasian Institute of Mining and Metallurgy. David Williams is employed by CSA Global Pty Ltd, an independent consulting company and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". David Williams consents to the inclusion in this presentation of the matters based on his information in the form and context in which it appears.

Information in this presentation that relates to Ore Reserves has been compiled by Mr Steve O'Grady, who is a Member of the Australasian Institute of Mining and Metallurgy. Steve O'Grady is a full time employee of Intermine Engineering and produced the Mining Reserve estimate based on data and geological information supplied by Mr Williams. Mr O'Grady has sufficient experience which is relevant to the estimation, assessment, evaluation and economic extraction of the Ore Reserve that he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Minerals Resources and Ore Reserves". Steve O'Grady consents to the inclusion in this presentation of the matters based on his information in the form and context in which it appears.

### VERTICALLY INTEGRATED BUSINESSES FOR MANUFACTURE **OF BATTERY GRAPHITE FOR THE LITHIUM-ION MARKET**





(spherical) graph	ng of battery hite for lithium-ion eries	Scalable mining projects for long term supply of graphite products		
Australia / A	Asia / Europe		o Graphite Project nancing Advanced	
Total	pre-tax NPV <sub>10</sub> US\$ <sup>2</sup>	JS\$546m a 121.5m	and EBITDA (geared, nominal terms)	
Shares on issue	Key hold	lers	Financial	
Listed 306m F-diluted 307m	Mitsubishi UFJ G JP Morgan Nomi Board 10	nees 11.8%	Cash (1 Oct) – \$1.4m Share Price – 9.2c Mkt Cap - A\$29.9m	

### Strong mix of graphite expertise, commercial and project development

- Kibaran Chairman Robert Pett, Managing Director Andrew Spinks and Project Director Grant Pierce OAM established Tanzania's Golden Pride Mine which was the recipient of the President's Award in Tanzania for environmental excellence
- German-based director Christoph Frey is a globally recognised graphite expert.
- Howard Rae, CFO has over 20 years' experience in project financing
- Listed on the Australian and German (Frankfurt) stock exchanges

### **2019 HIGHLIGHTS**

Milestone year with the first EcoGraf development advancing towards a 'Final Investment Decision' and strong Government Support in Tanzania expected to result in financier approvals for Epanko

## 🔁 EcoGraf

- Delivered GR Engineering studies for planned purification facilities in Asia and Western Australia.
- Selected and declared Kwinana as preferred site for first facility
- Continued extensive customer product qualification program using new spheronising piloting equipment
- Received WA State Government support and commenced pre-development activities, including engineering, permitting and environmental approvals.
- Debt financing process commenced with potential lenders

2020 Priorities - Complete pre-development activities, secure Final Investment Decision in 1H CY2020 and commence Kwinana construction

## **X** TANZGraphite

- KfW IPEX-Bank mandated for US\$40m Epanko debt funding
- Extensive high-level meetings in Tanzania to satisfy financier regulatory requirments
- Commenced US\$20m debt funding program with an additional lender for a total project debt funding of US\$60 million

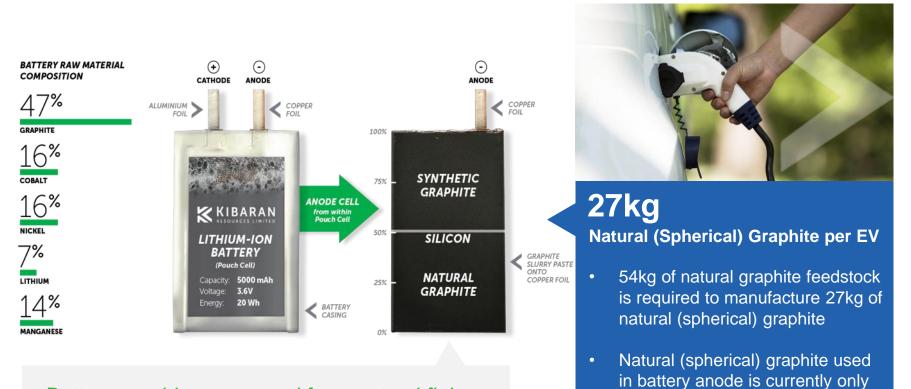
#### 2020 Priorities - Secure financial approvals for Epanko debt financing program

### Corporate

- Attracted another large institution to the register with Mitsubishi Financial Group
- Resolved all R&D matters and received approval for overseas R&D for a total \$8.4m
- Proposed name change to EcoGraf Limited

### **BATTERY MARKET OPPORTUNITY: ELECTRIC VEHICLES**

### Global expansion of electric vehicle markets reliant on battery graphite



Battery graphite processed from natural flake graphite into a 99.95% high purity product suitable for anode manufacturing

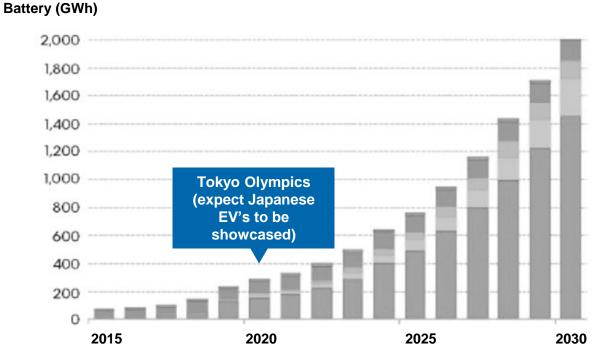




sourced from China

### **BATTERY GRAPHITE DEMAND**

Global expansion of electric vehicle markets forecast to drive a 700% increase in annual natural spherical graphite demand by 2025  $_{Roskill}$ 



200 GWh = 4 million EV's = 100,000t

Natural (Spherical Graphite)

## **EcoGraf** GERMAN LED EUROPEAN BATTERY ALLIANCE

Major investment underway in battery manufacturing for Electric Vehicles

- Currently all German EV's are reliant on Asian battery anode cells
- German Government announced support for 3 new battery alliances
  - 1 billion euros to preserve the automotive value chain in Germany and Europe
- Raw materials shift into Europe expected from 2023/24



### LATEST MARKET NEWS JUNE – NOVEMBER 2019

Investment continues in Europe to transition towards renewable energy for vehicle and industrial applications, supporting the shift to new raw material supplies.

Germany Gov't announced

that it would make 1 billion

euros in subsidies available

to help enhance and preserve

the automotive value chain in

VW begins electric makeover

as it unveils the ID3. The first

Germany and Europe.

cars will be delivered to

spring of 2020.

customers in Europe in the

Volvo announced that it will

become the first car maker to

implement global traceability by

applying blockchain technology.

Elon Musk confirmed Tesla is

going to build Gigafactory 4 in

Germany that is expected to be

operational by the end of 2021.



Toyota increases EV production and Volkswagen invests €900m to establish a new battery production facility with Northvolt.



Germany will award to three consortiums 1 billion euros in funding it earmarked last year to support domestic battery cell production.



CATL hikes investment in German battery plant 1.8 billion euros from a previous plan of 240 million euros to expand output.



By 2030, Daimler aims to have all-electric and plug-in hybrids make up more than half of its car sales.



German government supports second European EV battery consortium with BASF, BMW.











VW has announced plans to build 75 variants of electric car and around 60 hybrid vehicle models. By 2029 around 26 million electric cars will be built.

#### **GERMAN GOVERNMENT**

"Germany and Europe need to develop and build competitive, innovative and environmentally sustainable battery cells"

#### VOLVO

"Customers can drive electrified Volvos knowing the material for the batteries has been sourced responsibly"

#### VOLKSWAGEN

*"invest 60 billion euros (\$66.12 billion) by 2024 in E-mobility"* 

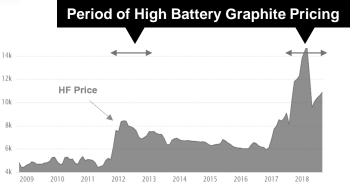


## **EcoGraf** ECO-FRIENDLY AND COST COMPETITIVE ALTERNATIVE TO EXISTING SUPPLY

#### China's top graphite producing provinces



- All battery graphite is presently produced in China using hydrofluoric (HF) acid to achieve 99.95%C with Hubei and Shandong the largest producing areas and increasingly subject to environmental regulation
- HF is a major contributor to the cost of Chinese battery graphite production due to increasing input costs and environmental requirements for the management of fluorine enriched wastes
- EcoGraf non-HF method is both cost competitive and eco-friendly compared to Chinese products





Chinese graphite ore with high quartz (silica) content of 40% (SiO<sub>2</sub>).

HF is the only acid that will digest high silica remaining in the graphite concentrates.



## **EcoGraf** BATTERY GRAPHITE BUSINESS SUMMARY

### **MANUFACTURE OF BATTERY GRAPHITE – WESTERN AUSTRALIA**

<b>Business Description</b>	Production of spherical graphite in Western Australia using a new eco-friendly process Initially supplying existing Asian markets, thereafter expanding to meet new European growth							
Key Milestones	<ul> <li>✓ Feasibility studie</li> <li>✓ 2 years of pilot p</li> <li>✓ Process</li> <li>✓ Success</li> <li>✓ Agreement in pla</li> <li>✓ Product samples</li> <li>America and Ge</li> </ul>	Engineering design and costings completed for Western Australia and Asia with Europe to follow						
Production	Staged production Additional production	-		-		ng to 20,000	tpa by 2022	
		САР	ITAL		NCIAL RETU	RNS @ 20,0	00TPA	
Strong Economic Returns		5,000tpa	15,000tpa	Pre-tax NPV <sub>10</sub>	EBITDA	IRR	Payback	
	Kwinana, WA	US\$22.8m	US\$49.2m	US\$141m	US\$35m	37.0%	~4yrs	



## **EcoGraf** MANUFACTURING PROCESS

Process flowsheet and planned scale-up de-risked through process optimisation, engineering, off the shelf equipment, extensive product qualification and endorsement of customers for eco-friendly products

Agreements in place to secure feedstock



#### - 100 mesh @ 94-95%C natural flake graphite

Produced through crushing, grinding and flotation

Off the shelf equipment in use in China



## Mechanical grinding and shaping

Micronising and spheronising using standard milling equipment

- ✓ 50% fines bi-product for sales into various markets
- Ability to purify fines for sales into higher value market

International patent pending for chemical purification process



Multi-stage chemical purification, washing and filtration process (eliminates HF)

### 🔁 EcoGraf

✓ Eco-friendly
 ✓ Cost effective
 ✓ Supply diversity

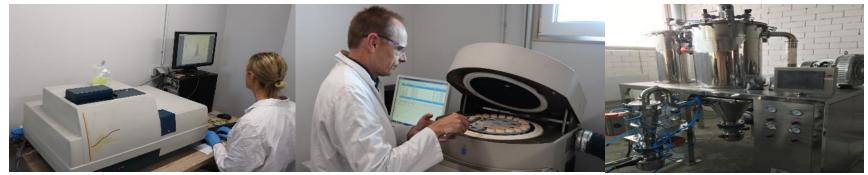


Purified battery (spherical) graphite for sale into lithiumion battery market

## **EcoGraf** DEVELOPMENT HISTORY

## Over 3 years of intensive test work and process design to develop a new eco-friendly chemical process that provides a cost competitive alternative to existing Chinese supplies

- Test work performed in Australia and Germany conducting >100 trials using a systematic, scientific method to
  optimise the purification process with R&D support from the Australian Government
- Evaluation of all leading micronising and spheronising equipment, resulting in improved yields of 45-55%
- Extensive product testing by potential customers in Asia and Europe confirms attractiveness of EcoGraf product as a high quality and cost effective alternative to existing Chinese supply
- EcoGraf effectiveness demonstrated through successful application to 10 existing sources of natural flake graphite from Europe, Africa, Asia and South America
- EcoGraf process suitable for purification of fines (by-products), providing options to generate additional revenues from high purity fine graphite products
- Engineering studies completed to construct facilities in Western Australia and Asia, with Europe to follow





## **EcoGraf** PRODUCT QUALIFICATION

Over 80 graphite product samples, including various grades of spherical graphite, tested successfully by battery anode manufacturers in South Korea and Japan

### **Product Spec (SpG15)**

Carbon Content	>99.95%
Moisture	>0.2%
pH-Value	6-8
d10	> 9 micron
d50	14.5 – 15.5 micron
d90	< 25 micron
Tap Density	>0.93 g/ml
SSA	< 7 m²/g
Fe	<15 ppm
Ni	< 6 ppm
Zn	< 5 ppm
Cr	< 5 ppm
Al	< 10 ppm
Са	< 10 ppm
Cu	< 5 ppm
S	< 20 ppm
Si	< 20 ppm

#### Typical physical properties

Particle size distribution: d10 = 10 micron

d50 = 15 micron d90 = 23 micron

Tap density: 0.99 kg/l Carbon Content: 99.97% Moisture: 0.1%

- Battery graphite samples (SpG14.5, 15 and 20) tested by battery anode manufacturers
- Testing confirms EcoGraf product meets all battery anode manufacturers' specifications

## Typical ICP analysis result of EcoGraf purified spherical graphite sample

Element	Ag	AI	Ва	Bi	Са	Cd	Со	Cr	Cu	Fe	к	Mg	
ppm	>0.1	6.3	5.2	>0.6	5.9	>0.1	>0.2	0.3	0.3	7.1	6.6	1.5	
Element	Mn	Мо	Ni	Ρ	Pb	Si	Sn	Sr	Ti	V	W	Zn	Zr

#### Battery Results of EcoGraf purified spherical graphite sample

Discharge Capacity 3<sup>rd</sup> Cycle Discharge Efficiency 1<sup>st</sup> Cycle 367 mAh/g 94.5%

## **EcoGraf** SPHERICAL GRAPHITE PRICE GROWTH

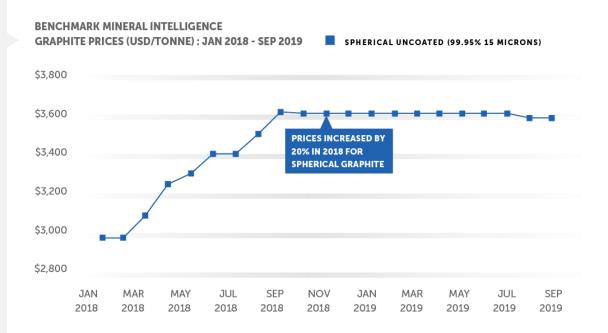
Chinese demand increased 40% in 2018 with rest of world demand to exceed 100,000 tonnes by 2020

### Latest News:

- Prices increased 20% during 2018
- Benchmark Minerals reports battery graphite exports from China rose 16% from January-July 2019, with battery graphite growing over 200%

### **Positive Pricing Outlook:**

- Restriction in Chinese supply due to increasing environmental pressure with fluorine residues
- Limited availability of high-quality battery grade graphite to satisfy customer requirements



## **EcoGraf** kwinana, western Australia

### Federal and State Government support for new technology and value added manufacturing

- Lead Agency role by WA Government Department of Jobs, Tourism, Science and Innovation establishing a "Lithium Valley"
- 6.7ha industrial site within Kwinana Industrial Area (KIA)
- Pre-development activities, including engineering, permitting and environmental approvals in progress
- EcoGraf R&D programs totalling A\$8m given advance approval by AusIndustry
- Final Investment Decision by mid-2020



### Western Australian advantages

- Leveraging Australia's reputation as a reliable supplier of high-quality industrial products
- KIA emerging as a global hub for value added processing of battery materials
- Direct port access and ready supply of skilled labour, power and key reagents
- Ethical transparency of the battery raw material production supply chain for customers
- Protection of intellectual property rights for additional downstream processing activities (coatings)

### **KWINANA DEVELOPMENT**

Major investment in Europe requiring ethical raw material underway





NIL

## **EcoGraf** KWINANA PLANT LOCATION

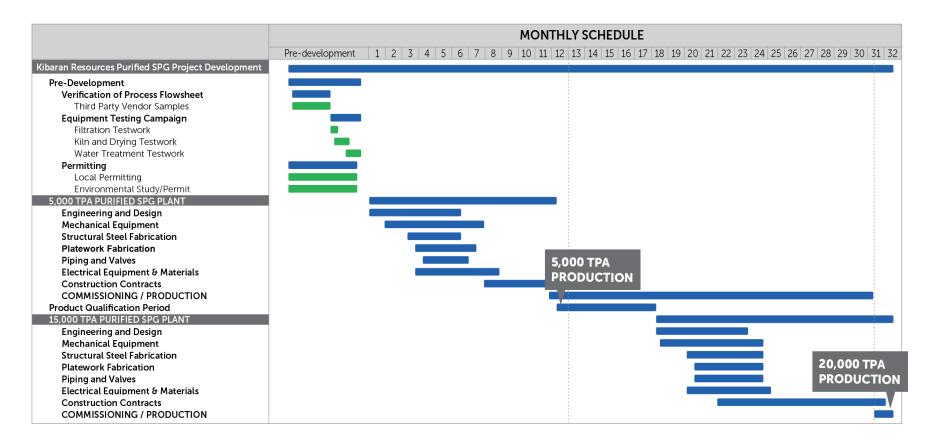
Ideally situated for transport of product to and from Fremantle Container Terminal and direct access to reagent suppliers, infrastructure services and highly skilled labour





## **EcoGraf** DEVELOPMENT TIMETABLE

### Expansion to 20,000tpa commences 6 months after initial production



## **EcoGraf** POSITION IN BATTERY SUPPLY CHAIN

### Illustration of major market participants in the lithium-ion battery supply chain

Raw Materials	Anode Battery Materials	Battery Manufacture	OEM - Electric	Vehicles
(High quality Purified Spherical Graphite)	(Coated Spherical Graphite SPG)	🕒 LG Chem	GM PAR	
🔁 EcoGraf	Hitachi <b>Chemical</b>	CATL		Volkswagen
	POSCO CHEMTECH	Panasonic	нулан	VOLVO
		SAMSUNG SAMSUNG SDI		AIMLER
		於 杉杉科技 Shanshan Technology	NISSAN	YUASA
	お た 杉 科 技 Shanshan Technology	SVOLT 蜂巢能源		
		northvolt	(KIA)	
	power your life	TESLE SK innovation	ΤΟΥΟΤΑ Τ	==
		Institute of TechnologyInnovation	NEC	

## **TANZ***Graphite* **FLAKE GRAPHITE BUSINESS SUMMARY**

EPANKO GRAPHITE PROJECT	
Description	Natural flake graphite project
Location	Epanko Valley, Mahenge, Ulanga District, Morogoro Region, Southern Tanzania
Status – ready to construct	Bankable Feasibility Study completed June 2017 Independent Engineer's Due Diligence via KfW and SRK completed August 2017 Debt financing with German and Australian lenders
Social and environmental planning	<ul> <li>Completed to Equator Principles standards and achieved:</li> <li>International Finance Corporation Performance Standards</li> <li>World Bank Group Environmental, Health &amp; Safety Guidelines</li> </ul>
Production	Stage 1 is 60,000 tonnes per year of natural flake graphite Scalable development model enables rapid expansion to meet market demand
Construction cost	Stage 1: US\$89 million
Strong economic returns	US\$44.5m pa EBITDA // 38.9% IRR // 3.5yr payback // US\$211m pre-tax $NPV_{10}$
Committed sales and offtake with major international customers	Thyssen Krupp (Germany) and Sojitz Corporation (Japan) Offtake agreements in place for Stage 1



### **SUMMARY & NEXT STEPS**

## EcoGraf

### **BATTERY GRAPHITE FACILITY**

Spherical Graphite (SPG) (F) Fines (UN) Unpurified (P) Purified

	KWINANA	ASIA
Production	20ktpa	20ktpa
NPV <sub>10</sub>	US\$141m	US\$194m
EBITDA	US\$35m	US\$42m

### Sales and offtake arrangements

- Debt financing
- Pre-development activities
- Final Investment Decision expected in 1H CY2020

### **TANZGraphite**

#### **EPANKO GRAPHITE PROJECT**

Natural Flake Graphite (NfG)

Production NPV<sub>10</sub> EBITDA

+

60ktpa US\$211m US\$44.5m

TANZANIA

 Secure financier debt financing approvals on final regulatory matter in Tanzania



# **EcoGraf** The future is electric.