#### 6 AUGUST, 2014



#### UPDATED INVESTOR PRESENTATION

Talga Resources Ltd ABN 32 138 405 419

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Corporate Information ASX Code TLG Shares on issue 124.6m Options (listed) 7.75m Options (unlisted) 6.25m

Company Directors Keith Coughlan Non-Executive Chairman

Mark Thompson Managing Director

Grant Mooney Non-Executive Director Talga Resources Limited (ASX:TLG) ("Talga" or "the Company") is pleased to provide an updated presentation.

The presentation summarises and updates Talga's corporate structure and information specific to the Company's wholly owned Nunasvaara graphene deposit in Sweden. The presentation will be made available on the Company's website <u>www.talgaresources.com</u>.

For further information, contact:

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Tel +61 (08) 9481 6667 Email admin@talgaresources.com





# Talga Resources Ltd Investor Presentation Diggers & Dealers August 2014



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# **Executive Summary**

- Talga Resources Ltd ("Talga") ASX:TLG is developing the world's highest grade graphite mineral **resource**<sup>1</sup>, located in the Kiruna mining district of Sweden.
- In recent tests Talga has demonstrated a world-first ability to produce high quality graphene direct from its raw (uncrushed/unpurified) graphite ore which provides Talga with unique economic advantages compared to global graphene peers.
- This new low cost and abundant supply potential is a paradigm shift in the production outlook for bulk graphene, a high-value 'wonder' material with huge growth potential.
- Talga has defined 7.6 million tonnes source ore to date and is ramping up its low-cost development to focus on becoming a global graphite and graphene supplier with industry leading margins.
- The Company is transitioning to a sole graphite/graphene focus by divesting non-core assets including iron ore projects in Sweden and gold projects in Australia.
- Near term potential value catalysts include new upscaling of metallurgical process with breakthrough graphene option, commercial/sales agreements and scoping study utilising dual graphite/graphene production.







# **Talga Resources Corporate Overview**

<b>Board of Directors</b>	
Keith Coughlan	Non-executive Chairman
Mark Thompson	Managing Director
Grant Mooney	Non-executive Director

#### Share Price last 12 months ASX:TLG



<sup>1</sup>2.75m @ 40c director options expiry 30 Nov 2014, 0.5m @ 35c employee options expiry 21 Jul 2015, 0.5m @ 45c employee options expiry 3 Oct 2016, 2.5m @ 54c director options expiry 23 June 2019.





Capitalisation Summary at 30 June 2014	
ASX:TLG Ordinary Shares	124.6N
ASX:TLGO Options (exp 30 Nov 2015 at 35c)	7.75N
Unlisted Options <sup>1</sup>	6.25N
Cash \$AUD	\$4.3N
Market Capitalisation (undiluted, @ \$0.38)	\$47.3N
Top Shareholders (+3%) at 30 June 2014	
Lateral Minerals Pty Ltd (Mark Thompson)	11.4%
Gregorach Pty Ltd	6.2%
Two Tops Pty Ltd	3.8%
Yandal Investments Pty Ltd	3.1%

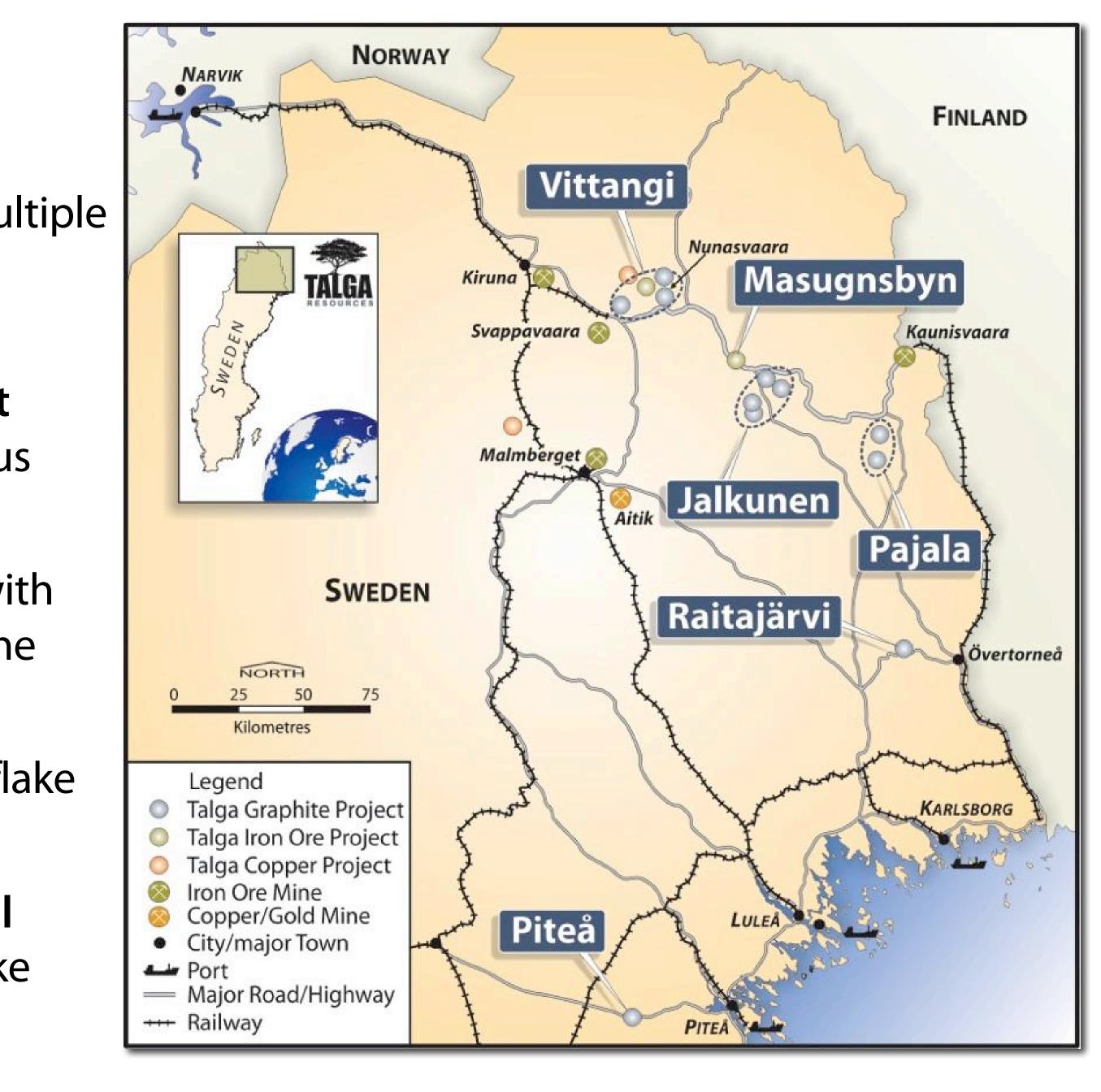




# **Talga's Graphite Projects**

- 100% ownership of five graphite projects with multiple deposits offering the full range of market size specifications.
- Two advanced stage projects in the development pipeline. These are drilled to JORC Indicated status and preliminary economic studies are underway;
  - Nunasvaara is a microcrystalline flake deposit with the highest JORC/NI43-101 resource grade in the world<sup>1</sup>. It is located within the Vittangi project.
  - *Raitajärvi* is a coarse flake deposit with 49% of flake classified large to jumbo size.
- At an earlier stage of drilling but exceptionally well located and containing >80% XL-size (jumbo) flake graphite is the *Piteå* project.

<sup>1</sup> See appendices for details of JORC (2004) resources and <u>www.techmetalsresearch.com</u> for world graphite resources grade comparison.



## **Established mining district with extensive milling and transport infrastructure**











Ranked No.1 mining jurisdiction in world by Fraser Institute 2013-14 Corporate tax rate 22%, Mineral Production tax 0.2% Low cost power from hydroelectricity and nuclear grid foreign mineral ownership only allowed since 1992

The 'Aitik' Cu-Au mine, northern Sweden. Owner; Boliden. Milling 36Mt annum ore.

**Established** bulk commodity infrastructure with open access rail, road and ports Well established mining province with highly skilled workforce and support industries Hosts world-class mineral deposits but remains under-explored relative to peers as



# Logistics Advantages

- Talga's projects located proximal to high quality sealed roads and open-access heavy haulage railway with direct link to Europe markets. No shipping required.
- Major cost advantage on delivery compared to shipments from other jurisdictions.
- EU consumes 20% of world's natural graphite production, and **imports 95%** of its needs (vast majority from China).
- EU has classified graphite as a "critical raw material".



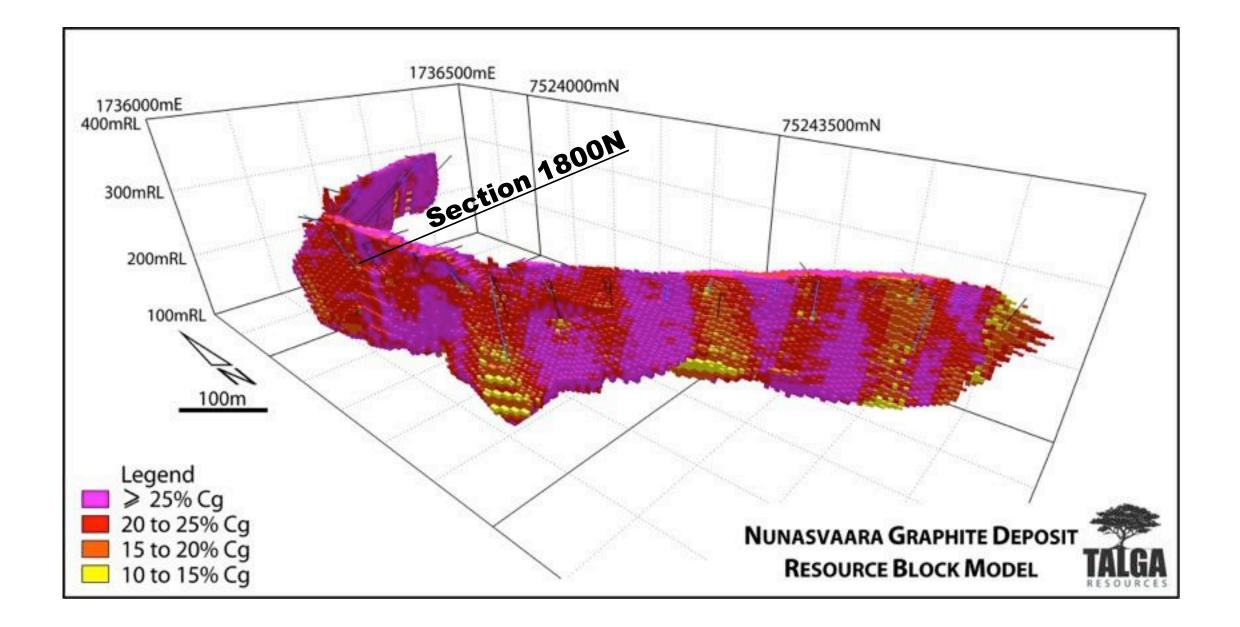
Öresund Bridge road/rail tunnel linking Sweden to mainland Europe

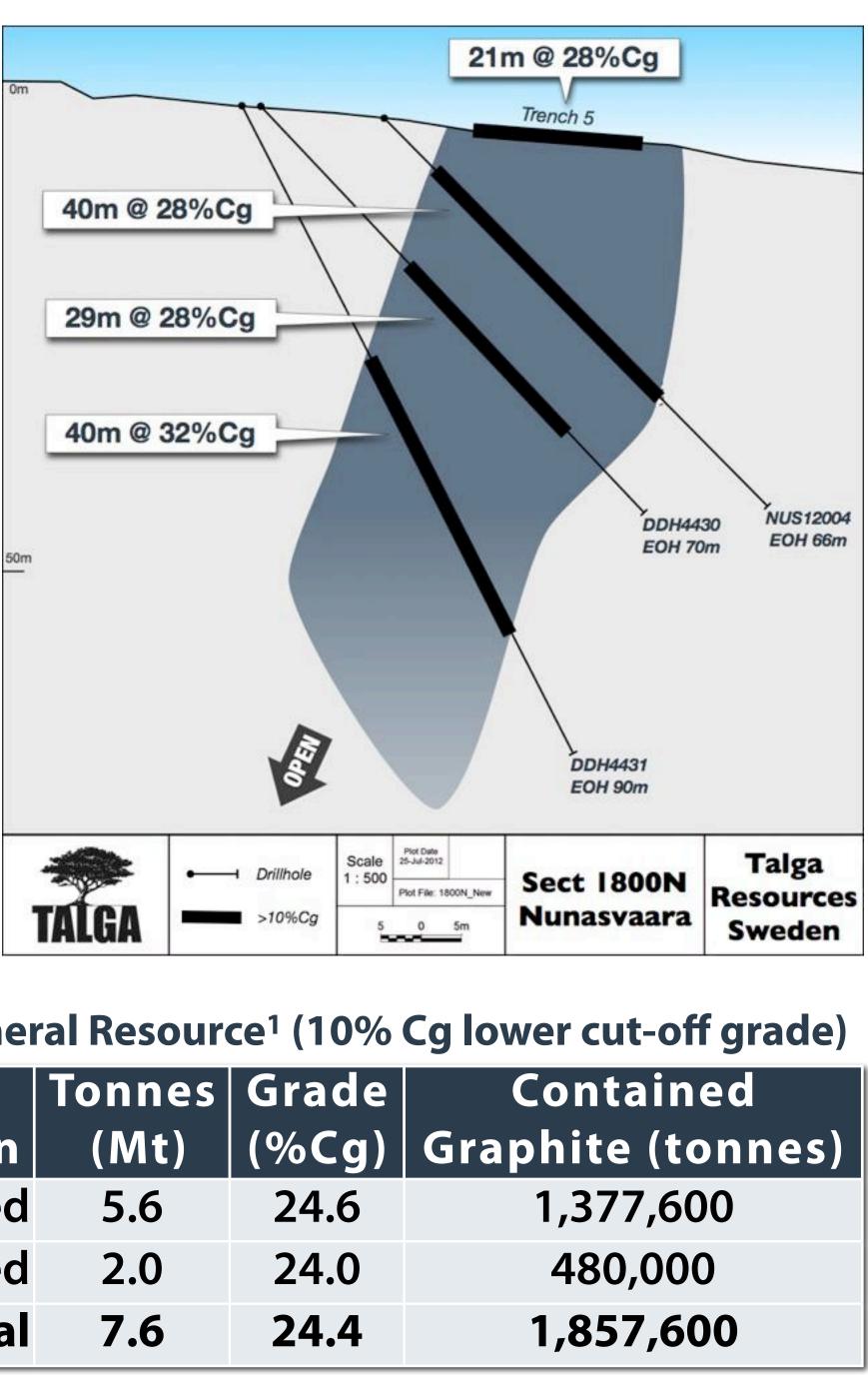




# Vittangi Project - Nunasvaara Graphite

- World's highest grade JORC/NI43-101 resource<sup>1</sup> of (ASX:TLG 8 Nov 2012) 7.6Mt @ 24.4% graphite ("Cg") (see appendix).
- Resource mineralisation from surface to 165m depth and remains open. Average true width 20m over 1.2km strike and remains **open along strike**. Mapped unit >15km in TLG 100% control.
- Graphite unit hosted within **atypically** low metamorphic grade volcanic greenstones with potentially unique mineralogy. **Robust** outcropping high grade resource makes low-cost potential in both ultrafine to fine graphite and bulk graphene market.





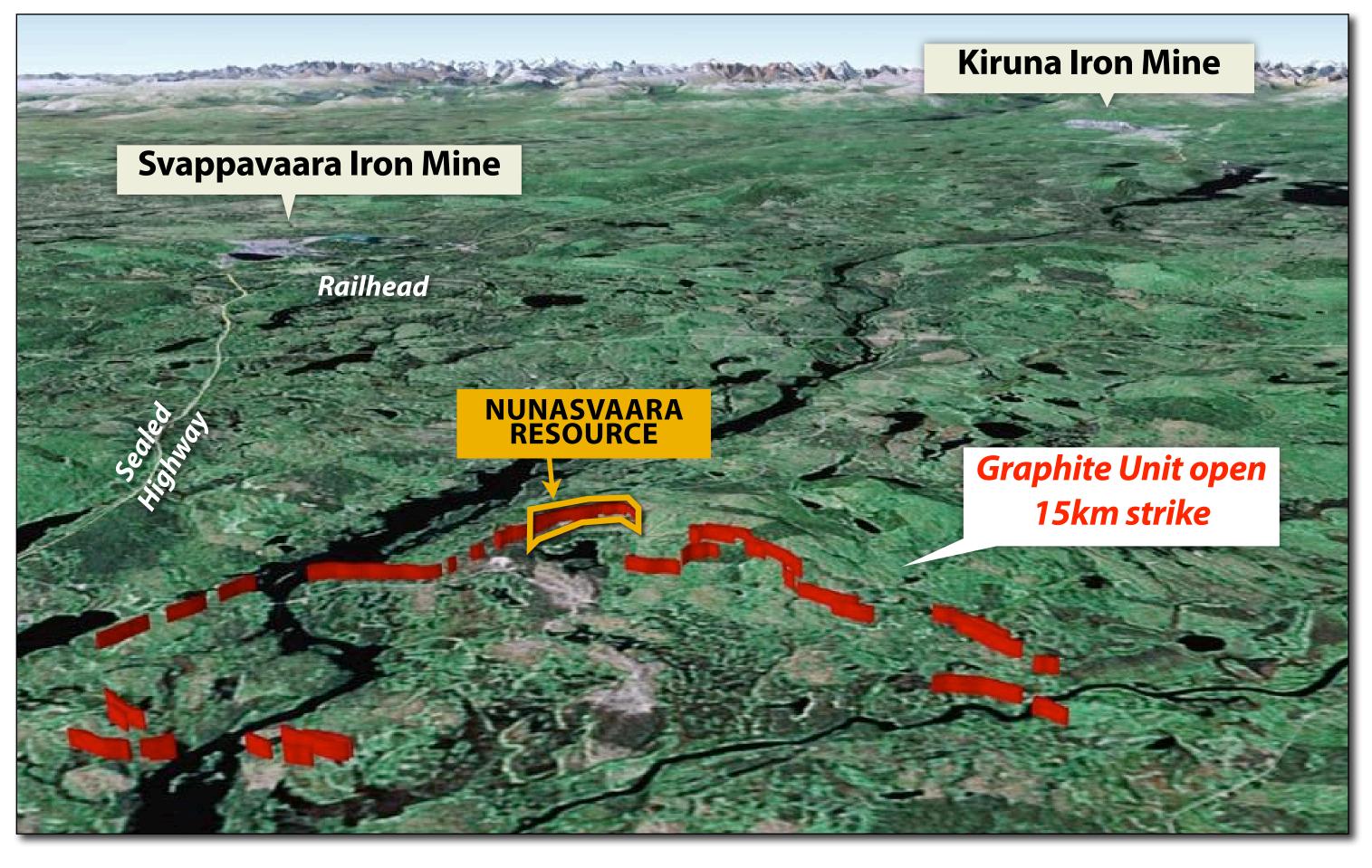
#### Nunasvaara Mineral Resource<sup>1</sup> (10% Cg lower cut-off grade)

<b>JORC 2004</b>	Tonnes	Grade	Contained
Classification	(Mt)	(%Cg)	Graphite (tonn
Indicated	5.6	24.6	1,377,600
Inferred	2.0	24.0	480,000
Total	7.6	24.4	1,857,600



# Growth potential and logistics advantages

- Graphite unit outcrops in part and is mapped over at least 15km
  strike. 100% controlled by TLG.
- Sampling by Talga of the outcropping unit averaged 26% Cg with grades up to 47% Cg.
- Less than 8% of graphite unit drill tested to date.
- Development advantages of exceptional grade, open-pit bulk mining option, low-cost grid power and nearby road/rail/port options (3km to road, 25km to rail).

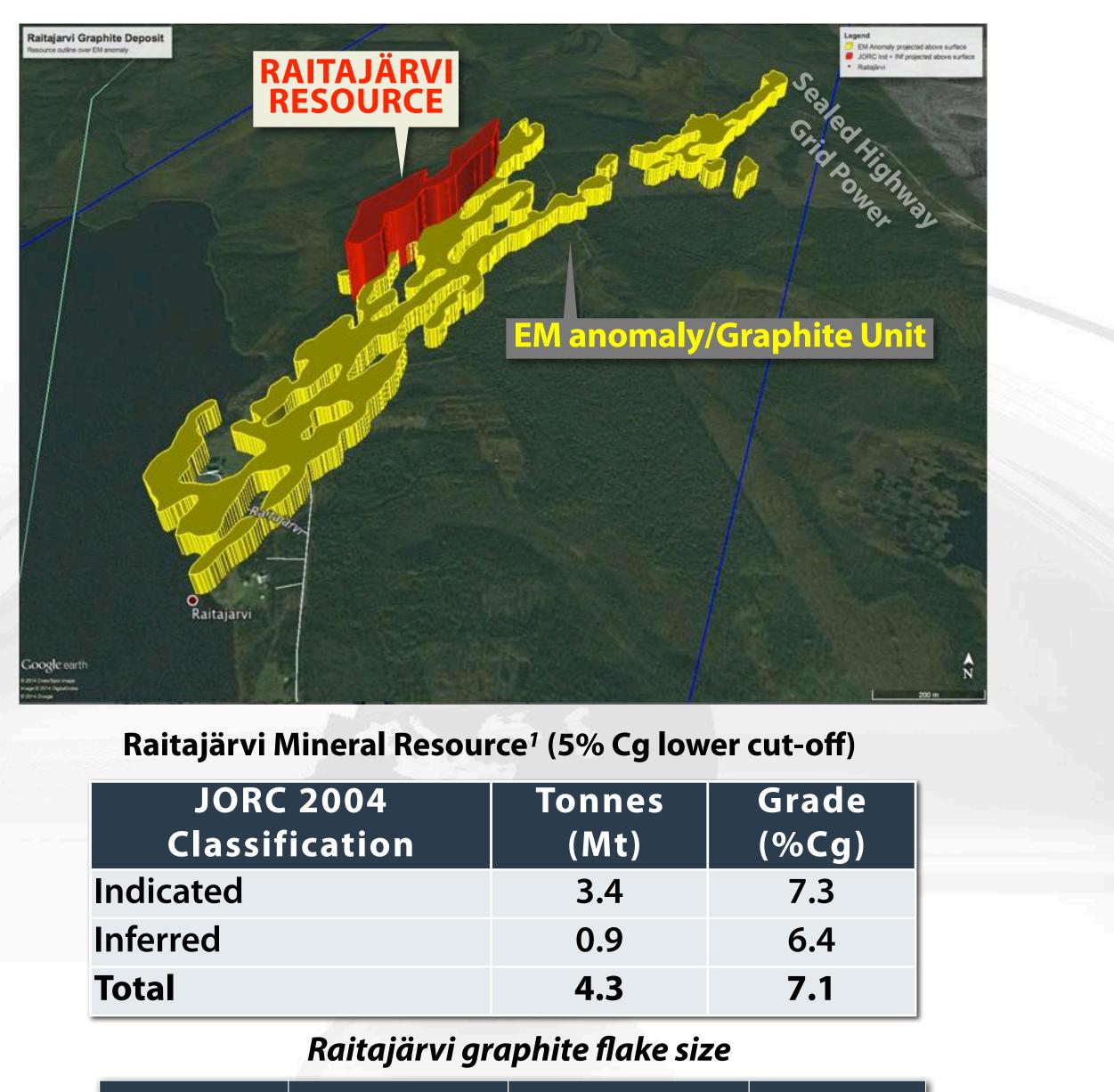






# **Other Graphite Projects -**Raitajärvi

- Indicated and Inferred 4.3 Million tonnes @ 7.1% Cg, JORC 2004 resource<sup>1</sup> open at depth and along strike.
- Near-surface deposit contains 87% coarse crystalline flake graphite with previous metallurgical work demonstrating up to 99.0%C purity concentrate.
- Significant portion 'large' and 'jumbo' size flake graphite in favor for production of lithium-ion battery electrodes.
- Advantageously located 2km from the Överkalix -Övertorneå Highway and grid power, 25km to town and railway.
- Capable of being 10-20,000t/annum output as second producer for Talga but excellent potential for size increase as remains open in all directions and less than 25% of the deposit's electromagnetic signature drill tested to date.



<b>JORC 2004</b>	Tonnes	Grade
Classification	(Mt)	(%Cg)
Indicated	3.4	7.3
Inferred	0.9	6.4
Total	4.3	7.1

< 100µm	100-200µm	200-400µm	>400µm
13%	38%	38%	11%

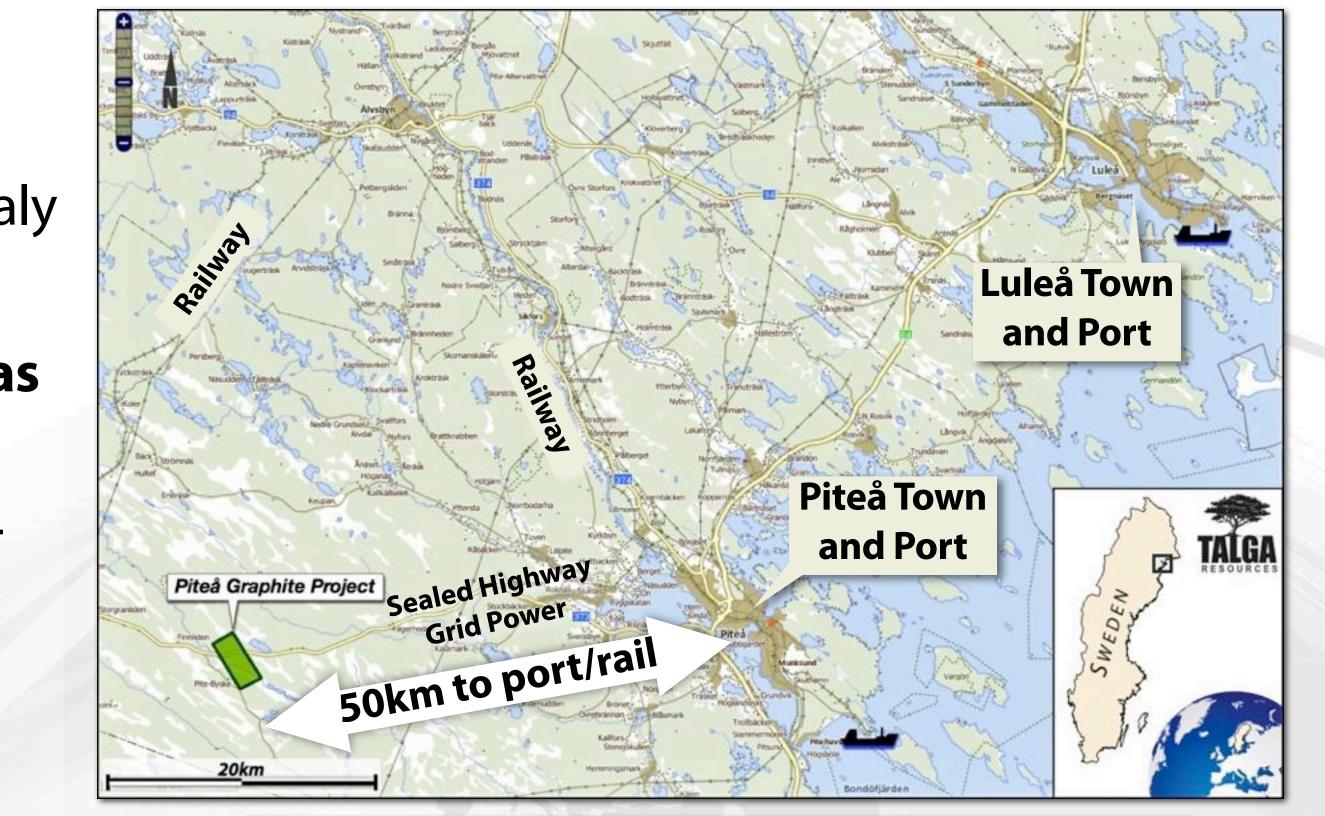
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# Piteå Project

- **Coarse flake** graphite within a 4 x 1km EM anomaly intercepted to date by 3 historic drillholes.
- Very large average flake size; >80% reported as 'jumbo' 300 μm (+50 mesh).
- Such large flake graphite is premium product for spherical graphite production and commands higher prices.
- Located on sealed road 50km from port of Piteå and adjacent to grid power.
- Adjacent EM anomalies pegged. Fieldwork to expand target zone and confirm drill targets after grant in 2015 for stage 2 drill testing.

< 100µm	100-300µm	300-600µm	>600µm
0%	45%	64%	18%

#### Piteå average graphite flake size

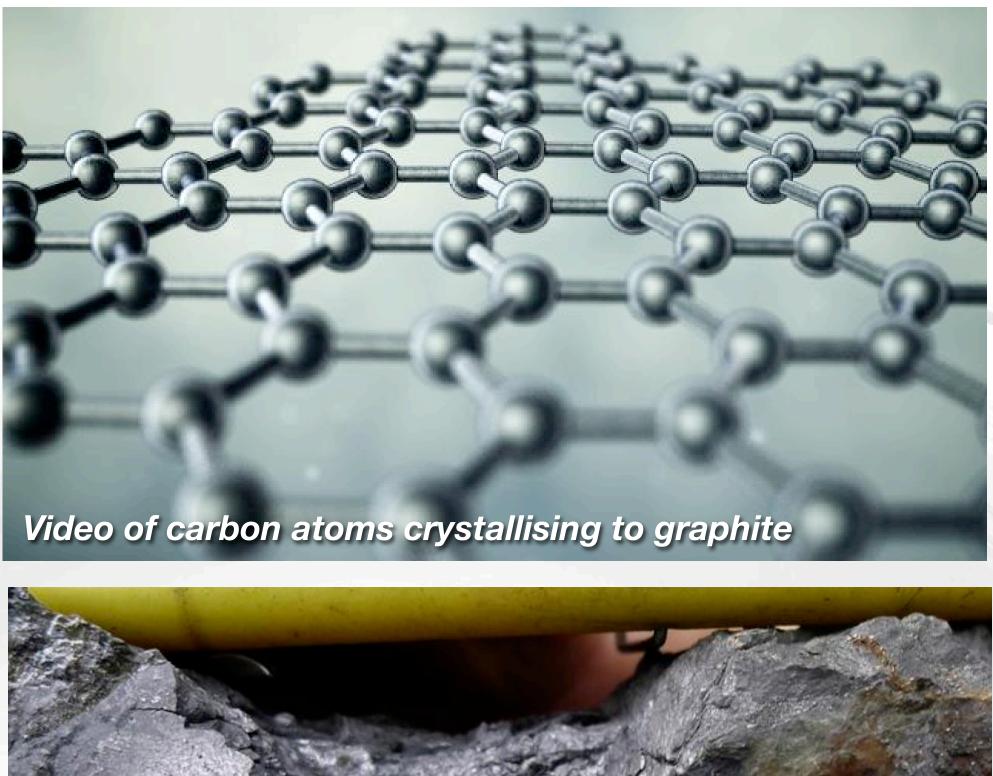


Coarse flake graphite present in historic drill core from the Piteå project stored at the SGU. Hole ÖNU89001, 44.2m depth.



# What is Natural Graphite?

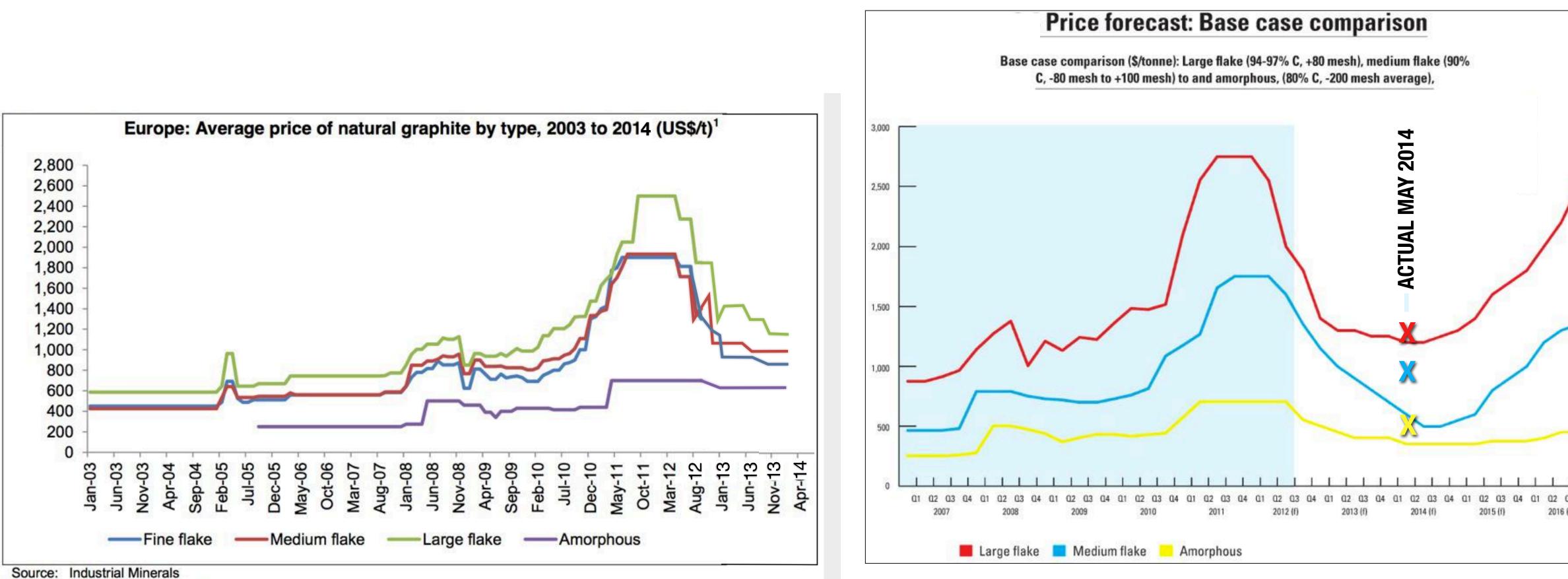
- **Graphite** is a crystalline form of carbon that forms in nature when carbon-rich rocks undergo metamorphism (pressure/ temperature induced change). It can be synthesised but at very high cost.
- Graphite (the mineral) consists of parallel sheets of carbon atoms in a hexagonal lattice, which when one or few atoms in thickness, are called graphene.
- Graphite has remarkable properties of electrical and thermal conductivity that make it useful for a large range of applications. Natural graphite demand is about 1.1Mt/yr, a volume similar to
- Nickel, with total value approximately US\$1B/yr.
- Graphite is most commonly sold as a concentrate by private contract. Industry prices are surveyed and published by Industrial Minerals magazine.
- Consumption is diverse with significant markets in steel production and refractories (>50%), automotive parts, lubricants and batteries.
- China and Brazil supply >80% world natural graphite.







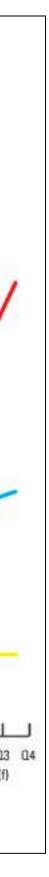
# **Graphite prices exceeding historic and forecast trends.**

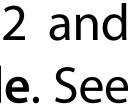


1-CIF European port FCL Notes:

#### Graphite prices now steady, with flake 50% higher and amorphous 100% higher than long term averages.

Prices have exceeded forecasts since end of 2012 and base case prices are trending to surprise on upside. See appendix for further price/market data.



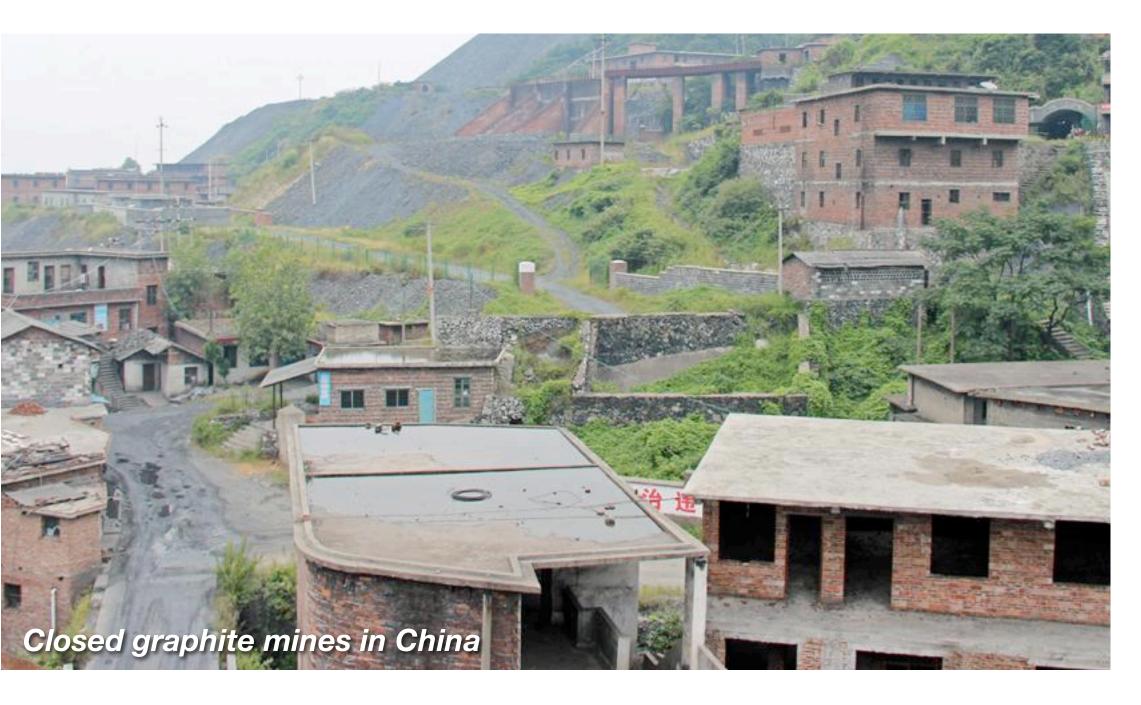




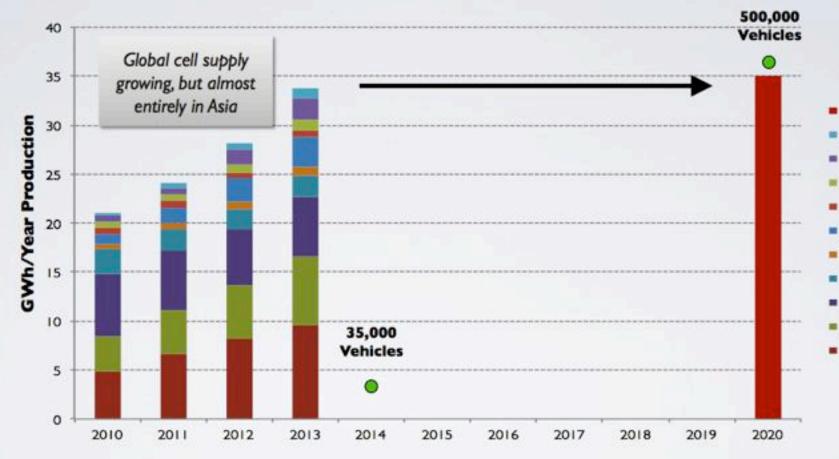
# **Graphite Drivers**

- China has maturing operations with rapidly declining production profiles but rising costs. Additional government consolidation and crackdown on environmental pollution has shut significant amount of graphite production. Graphite declared critical strategic mineral in UK, EU and USA.
- Graphite is a significant component of many types of battery, particularly Li-ion which contain 10x more graphite than lithium in battery anode. Electric vehicles can use up to 100kg graphite per vehicle in batteries.
- Rapid growth taking place in EV's causing shortages. **Tesla** recently announced plans for a **US\$5B** Li-ion battery 'gigafactory' that alone will require the graphite equivalent to 6 new mines. Other manufacturers may compound shortage.
- Outlook is for decreasing supply while new applications create new markets; with pivotal roles in energy transport, storage and performance.





Planned 2020 Gigafactory Production Exceeds 2013 Global Production

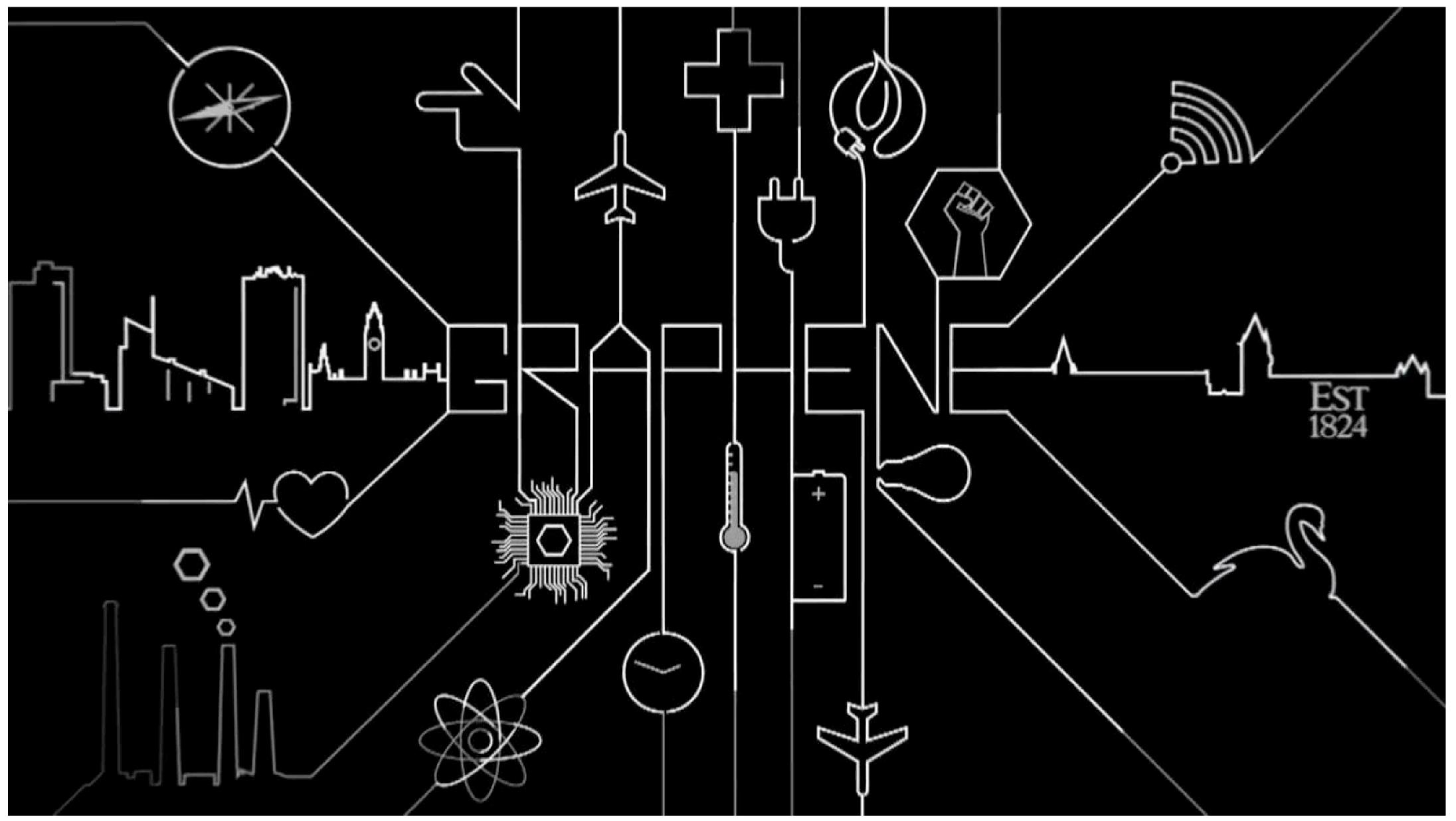


Battery pack cost/kWh reduced >30% by Gen III volume ramp in 2017





## Graphene; What is it & the buzz out of Manchester



Video: Courtesy The University of Manchester



# **Graphene Market** Commercialisation is here

- While the media is excited by future 'hi-tech' applications, and graphene-enhanced products are becoming available (tennis racquets, riding helmets) the main driver of near term graphene commoditisation may well be additives.
- Small amounts of graphene platelets (0.05-2%) added to common bulk materials<sup>2</sup> can impart *exponential* increases in strength e.g. cement (global consumption 3,300Mt/ann), and aluminium (50Mt) allowing less material/lighter builds. Similar additions of graphene to steel (1,606Mt) can impart anti-corrosion properties and plastics (288Mt) can become conductive. Conductive inks and 3-D inks are similarly productive applications.
- Talga can sell graphene it produces during development phases; metallurgical to pilot plant, from procesing drillcores. First sale of graphene completed July 2014 to German group Microdrop Technologies.

## **Global consumption of potential** graphene additive materials

## Concrete 3,300 million tonnes annum

Steel 1,606

Plastics 288

**Aluminium 50** 







# **Graphene has a Supply Side Problem** Pace of graphene uptake & commercialisation is hampered by current limitations of production scale and cost more than quality.

## Scale

Graphene Uptake

## Cost

## Quality

## Main factors delaying uptake of graphene platelets into ordinary products include:

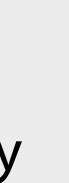
- Lack of scale: most production methods are not scalable to the large quantities required to guarantee supply and expand uptake
- High costs: platelets are still vastly expensive compared to most material inputs.
- Quality: most lower cost scalable production methods have reduced quality that limit applications/markets.
- Scale and Cost are main constraints as they have most physical limitations but **Quality** can be manipulated to a degree.















# The Graphite Ore Problem Graphite ore-to-graphene requires multi-stage expensive processes

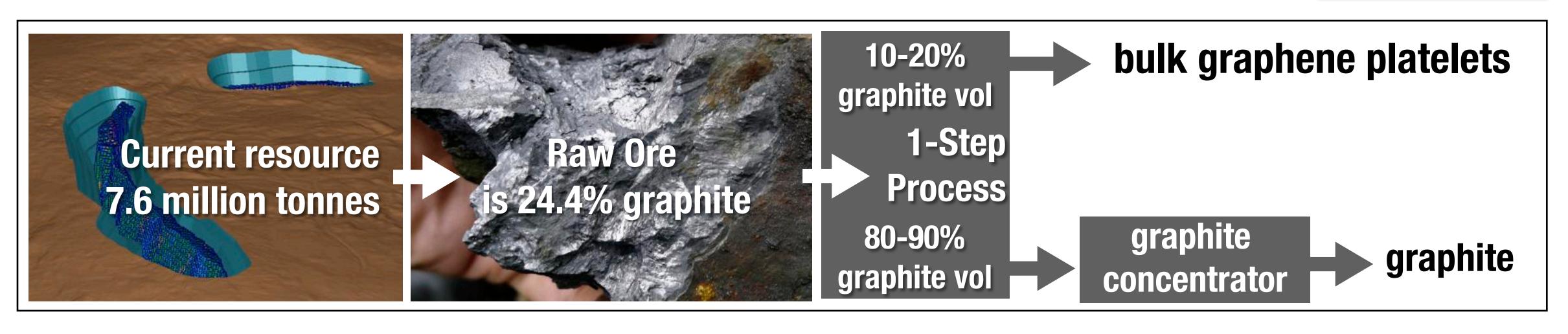
- The problem with scalable natural graphite sources though is they require multiple stages of crushing, milling and flotation to form a concentrate for further stages of purification commonly involving oxidation and reduction, sonication, electrode forming etc to reach graphene stage. The multiple stages increase costs and can decrease quality of the graphene.
- Other simple processes have either such low yields (eg, 'Blender' method) or require high purity (expensive) source material they are not commercial or cannot generate significantly lower cost of graphene supply.
- As graphite ores already contain 'natural graphene' an ultra-low cost path considering energy and commerciality is a single stage process where raw graphite ore can be processed to graphene without multiple steps.





# Paradigm Shift to Lower Cost

- Because of the unique characteristics of Nunasvaara ore deposit, both graphite and graphene platelets can be liberated from the ore in a single step process. This means no expensive multiple stage processing or purification stages that impart complexity and costs.
- The graphene is a byproduct of the graphite processing, so very low cost.
- This shows strong potential for Talga to enjoy a vastly different production and capital cost structure compared to other producers globally, and represents a paradigm shift in the production outlook for bulk graphene cost and scale.

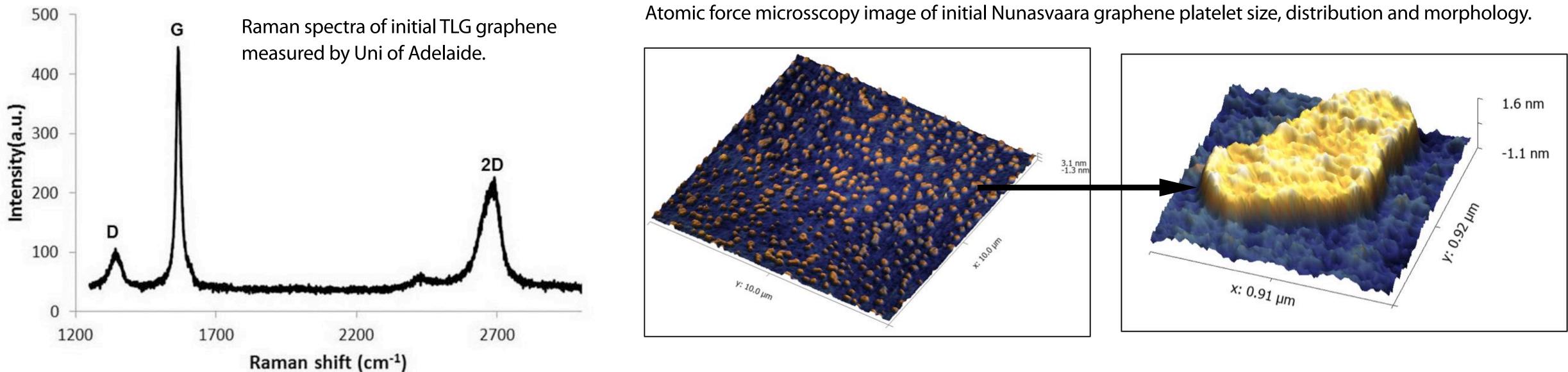






# **Quality and Consistency**

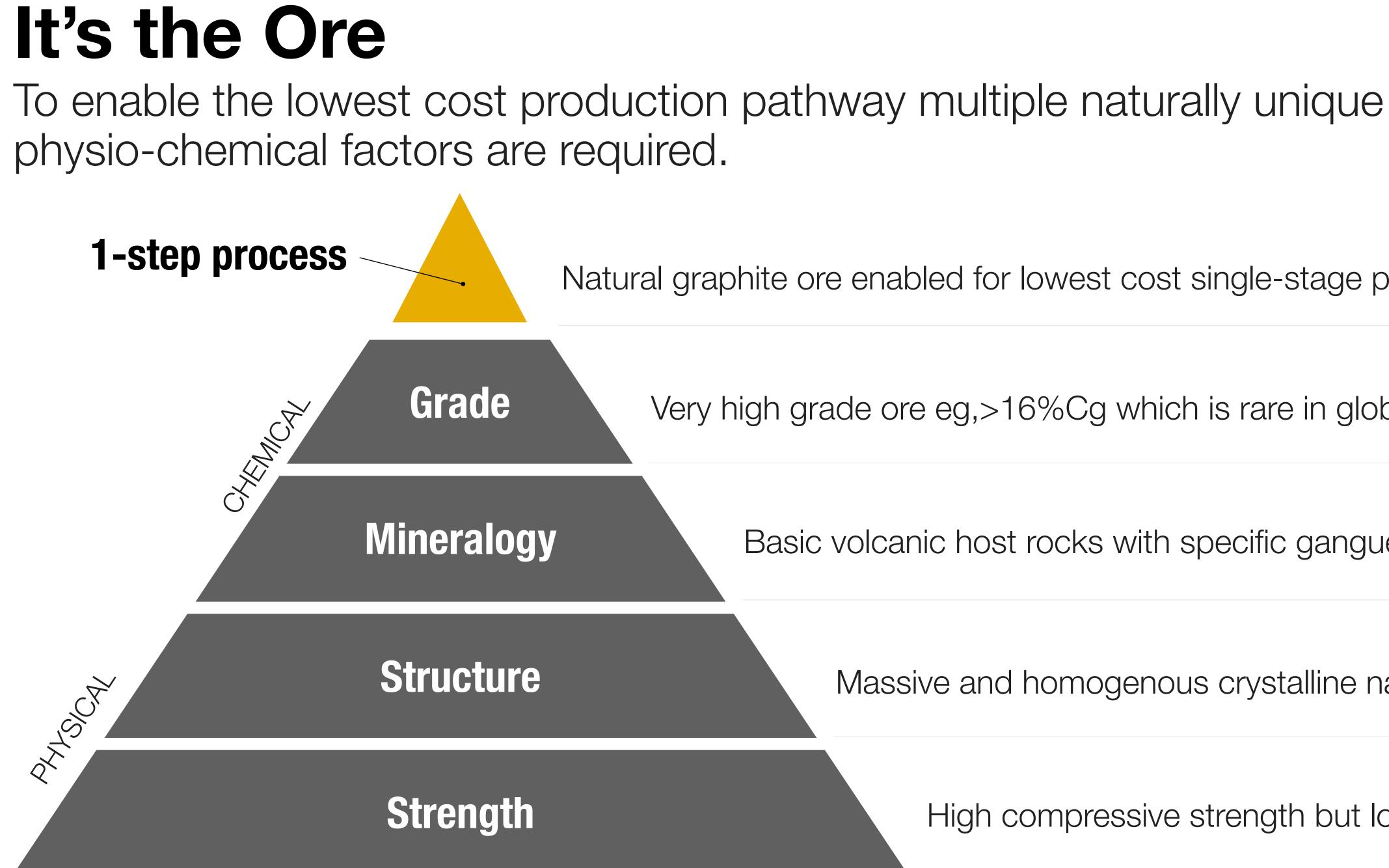
- The highly homogenous nature of the raw ore source provides a consistency in the morphology and quality of graphene produced.
- Some characters of size and quality can be modified and optimised to a degree in the production process.
- High potential for further optimisation and additional functionalisation.





Measurements demonstrate a few layered graphene (range 1-5 layers) of low D/G and D/ 2D ratio; a high quality result for such low cost and bulk scale production from raw ore.







Natural graphite ore enabled for lowest cost single-stage processing.

Very high grade ore eg,>16%Cg which is rare in global resources.

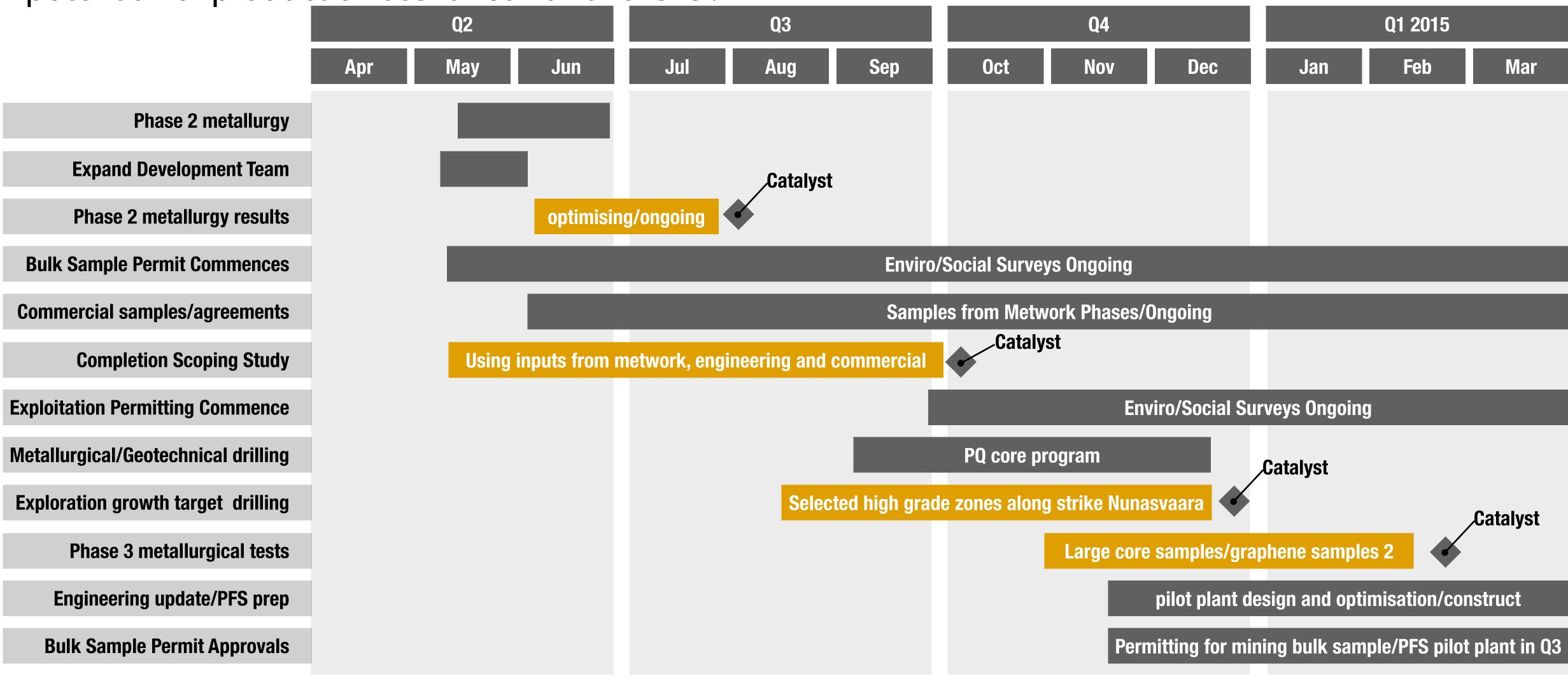
Basic volcanic host rocks with specific gangue mineral ratios.

Massive and homogenous crystalline nature.

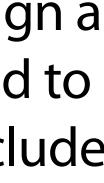
High compressive strength but low hardness.



# potential for production scenarios 10x this level.



 Nunasvaara - summary 12 month development plan
Process pathway has been demonstrated at benchtop scale and upscaling tests are underway to design a 5 tonne/hr pilot plant to be operational in north Sweden Jul-Sep 2015. The pilot plant will be designed to supply 100-200 tonnes graphene samples over few year test period. A scoping study underway will include





# Summary

- In recent tests Talga has demonstrated ability to produce high quality graphene direct from its raw (uncrushed/unpurified) graphite ore which provides Talga with unique economic advantages compared to global graphene peers.
- This new low cost and abundant supply potential is a paradigm shift in the production outlook for bulk graphene, and will be able to 'commoditise' supply into everyday applications.
- Talga has defined 7.6 million tonnes source ore to date and is ramping up its low-cost development strategy to focus on becoming a global graphene supplier with industry leading margins.
- The current development stages underway include upscaling the metallurgical process and completing a scoping study (Q3 2014), commercial agreement/customer development (ongoing) and permitting a trial mine/pilot plant for operation mid-2015.







# Talga's Graphite Development Advantages

- Highest grade JORC/NI43-101 graphite resource in world.
- World-first single step graphite/graphene production option.
- Low cost capex and bottom of production cost curve expected.
- Advanced stage PEAS underway; further major drilling not required.
- Massive growth profile; dominant land position on drilled EU graphite deposits.
- Located on road and rail routes to major markets, in highly ranked low-risk mining and corporate jurisdiction, Sweden.

To get further information or register interest contact: Mark Thompson - Managing Director 1st Floor, 2 Richardson St West Perth WA 6005 Australia Tel +61 89481 6667 email admin@talgaresources.com

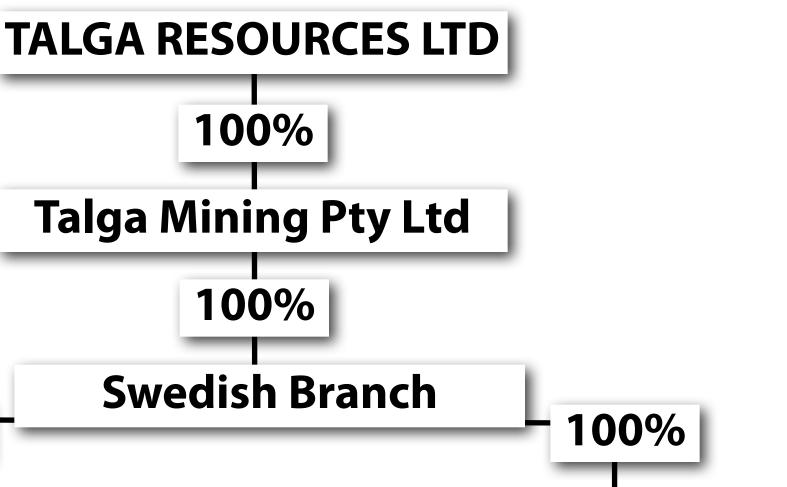




## Appendices **Talga Asset Structure and JORC** (2004) Resources\*

1 Note: This information was prepared and first disclosed under the JORC code 2004. It has not been updated since to comply with the JORC code 2012 on the basis that the information has not materially changed since it was last reported. The Company is not aware of any new information or data that materially affects the information included in the previous announcement and that all of the previous assumptions and technical parameters underpinning the estimates in the previous announcement have not materially changed.

100%





**Nunasvaara** Graphite Mineral Resource @ 10% Cg lower cut-off Nov 2012

Classification	Tonnes	Graphite
	(Mt)	(%Cg)
Indicated	5.6	24.6
Inferred	2.0	24.0
Total	7.6	24.4

**Raitajärvi** Graphite Mineral Resource @ 5% Cg lower cut-off Aug 2013

Classification	Tonnes	Graphite
	(Mt)	(%Cg)
Indicated	3.4	7.3
Inferred	0.9	6.4
Total	4.3	7.1





Iron Mineral Resources @ 20% Fe lower cut-off July 2013

	Tonnes	Grade	
Deposit	(Mt)	%Fe	JORC Categ
Vathanvaara	51.2	36.0	Inferred Reso
Kuusi Nunasvaara	46.1	28.7	<b>Inferred</b> Reso
Mänty Vathanvaara	16.3	31.0	Inferred Reso
Sorvivuoma	5.5	38.3	<b>Inferred Resc</b>
Jänkkä	4.5	33.0	<b>Inferred Resc</b>
Masugnsbyn	87.0	28.3	<b>Indicated Res</b>
Masugnsbyn	25.0	29.5	<b>Inferred Resc</b>
Total	235.6	30.7	





# Appendices

## **Graphite size classification.**

Trade Name	microns	Mesh Size (US)
Amorphous/Ultrafine	<10	na
Amorphous/Fine	10-75	-200
Small	75-150	200-100
Medium	150-180	100-80
Large	180-300	80-50
XL/Jumbo	>300	50+

Source: Industrial Minerals Natural Graphite Report 2012 cross referencing various sources. Many terms are proprietary or mixed use; there are few if any industry standards in naming principles.

## **Common natural graphite concentrate** product sizes, grades and prices

Size (microns)	Size US Mesh	Purity % C	Quote US \$/tonne
300+	50+	94-97	>1700
180-300	80-50	94-97	1275
100-300	00-30	90	1125
	100-80	94-97	1100
150-180		90	950
		85-87	750
75 150	200-100	94-97	900
75-150		90	775
-75	-200	80-85	525

Source: Industrial Minerals Magazine Mar 2014.

Most prices FCL, CIF European Port.

Note prices averaged from low-high range and selected as common commercial products where natural graphite sold as concentrate. Many specialty grades with much higher prices are traded but do not represent the bulk of market demand.







# **References & Qualified Persons**

1 Resource Note: All Talga owned resources referred to in this report are based on information prepared and first disclosed under the JORC code 2004. They have not been updated since to comply with the JORC code 2012 on the basis that the information has not materially changed since it was last reported. The Company is not aware of any new information or data that materially affects the information included in the previous announcement and that all of the previous assumptions and technical parameters underpinning the estimates in the previous announcement have not materially changed.

#### 2 Research references

Graphene in concrete "Materials Genome for Graphene-Cement Nanocomposites for Infrastructure Applications"; Hunain Alkhateb et al Department of Civil Engineering, University of Mississippi USA plus see http://www.monash.edu.au/assets/pdf/industry/graphene-oxide-reinforced-concrete.pdf Graphene in aluminium "Reinforcement with graphene nanosheets in aluminum matrix composites". Wang, J et al (2012). Scripta Materialia, 66 (8).

Graphene in plastics "Graphene Nanoplatelets: A Multi-functional Nanomaterial Additive for Polymers and Composites" (2013) Lawrence T. Drzal, Chief Scientist XG Sciences, Inc. Professor, Chem Engin and Materials Science Michigan State University Graphene on iron/steel "Hybrid nanocomposite coatings for corrosion protection of low carbon steel: A substrate-integrated and scalable active-passive approach," (2011) G.K. Rout et al, J. Mater. Res., 26, 837–44 and see http://www.steeltimesint.com/news/view/tata-partners-with-epsrc-to-developgraphene-coated-steels.

#### **Competent Person's Statement**

The information in this report that relates to Exploration Results is based on information compiled and reviewed by Mr Mark Thompson, who is a member of the Australian Institute of Geoscientists. Mr Thompson, an employee of the Company, has sufficient experience which is relevant to the activity which is being undertaken 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" ("JORC Code"). Mr Thompson consents to the inclusion in the report of the matters based on this information in the form and context in which it appears.

The information in this report that relates to Resource Estimation is based on information compiled and reviewed by Mr Simon Coxhell of CoxsRocks Pty Ltd. Mr Coxhell is a consultant to the Company and a member of the Australian Institute of Mining and Metallurgy. Mr Coxhell has sufficient experience relevant to the styles of mineralisation and types of deposits which are covered in this document 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" ("JORC Code"). Mr Coxhell consents to the inclusion in this report of the matters based on this information in the form and context in which it appears.

