FIRST GRAPHITE LTD

Graphene Operations Review

and

Capability Statement

first graphite
Australia's leading graphene company

August 2017

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Stock Exchange Listings

The Company is listed on the **Australian Securities Exchange** Limited under the trading code **ASX:FGR.**

The Company is quoted on the **Frankfurt Stock Exchange** under the trading code **FSE:M11**.

Registration Details

ACN: 007 870 760

ABN: 50 007 870 760

Further information can be obtained from the FGR website.

Executive Summary – The Path to Profitability in the Graphene Sector

First Graphite (ASX:FGR) is an ASX-listed micro-cap company that has been positioning itself to benefit from the expected exponential growth curve offered by the latest nanomaterial to come to market – graphene. FGR has made extraordinary progress in the development and proving of the world's lowest cost method of producing graphene, progressing from initial testing of the process to the construction of a commercial scale production facility in the space of less than two and a half years. That facility is expected to be operational by the end of 2017.

Graphene offers enormous opportunities to the manufacturing sector owing to its exceptional qualities of conductivity, strength, flexibility and impermeability to name a few. Adding graphene to existing materials will lead to quantum leaps in batteries and energy storage devices, new water filtration techniques, fire-proof coatings and polymers, anti-corrosive and anti-fouling paints, conductive textiles and geofabrics. The list is almost endless. So revolutionary are its qualities that enthusiastic scientists talk of the forthcoming Graphene Age as the next era after the Bronze and Iron Ages. The introduction of graphene to industry could be as significant as the introduction of plastics in 1959, or the internet in the 1990s. Graphene is an example of a truly disruptive innovation.

It is in this emerging new industry that First Graphite is seeking to position itself by becoming the lowest cost producer of the highest quality, bulk graphene currently available to the market. It will do this by using a combination of the highest-grade crystalline vein graphite in the world as the feedstock for its low cost exfoliated graphene production process.

As a downstream processer of mining products the Company is ambivalent as to where it gets its raw material from, provided it has security of supply. That is why First Graphite is sourcing the raw material from its own mines as well as buying from third parties, but that is only the beginning.

Every supplier of raw materials to industry faces the risk of having that product commoditised. This is why producers seek to be in the lowest cost quartile, to ensure that they can survive downswings in the commodity cycle. There is another restricting factor in being a supplier of raw materials, being the physical parameters that come with extractive industries such as mining. Key motivators to the strategy being employed by First Graphite are the desire to escape the commoditisation trap that confronts suppliers of raw materials, and the attraction offered by a business that is not bound by physical parameters. It wants to grow with the expanding market.

A vertically integrated business requires an array of skills not usually found in simple operations. In the case of the graphene supply chain, it starts with mining skills. First Graphite has these as a core competency. Next comes the downstream processing and product development skills. First Graphite is developing these both through training of existing personnel and the recruitment of external experts. This is where the development of intellectual property begins. Having established itself as a supplier of specialist downstream materials, it needs to find markets for that material. That involves yet another skill base. Fortunately there are organisations such as Traxys, the agent with whom First Graphite has secured a strategic relationship.

We have seen China emerge as the leading manufacturer in the world. It has effectively commoditised manufacturing processes through low costs and economies of scale. There is a warning there for any potential manufacturer; you have to be cheaper than China. The real store of value going ahead will be intellectual property (IP). First Graphite is developing IP in the graphene sector with a view to selling licences and collecting royalties from manufacturers. This is the best way of maximizing the value proposition and ensuring capital efficiency.

First Graphite does not underestimate the challenges as a pioneer in a new industry, but it has given itself the best chance of success through targeting the most profitable entry points and focusing on the highest quality feedstock. It is perfectly poised at the start of what promises to be a growth curve that can continue upwards for many decades. It is Australia's leading graphene company.

Graphene Operations Review and Capability Statement

Mission Statement: *First Graphite is an advanced materials company seeking to position itself in the lowest cost quartile of global graphene suppliers. It has developed an environmentally sound and safe method of converting its supplies of ultra-high grade graphite into the lowest cost highest quality graphene, in bulk quantities. In so doing it is addressing the three greatest impediments to the commercialisation of graphene, being reliable quality at realistic prices in sufficient volumes to facilitate the development of applications in modern materials, energy storage devices, coatings and polymers. It aims to use these competitive advantages to access new technologies and processes and in turn gain maximum leverage to the entire graphene supply chain, from sourcing the raw material to end use, with development of associated intellectual property for licencing and sales.*

Introduction

FGR commenced business as a prospective developer and producer of vein graphite in Sri Lanka in 2014. Subsequent recognition of the potential to undertake downstream processing of the graphite to produce very high value graphene has led to a realignment of objectives, such that the importance of the graphite production and supply should now be seen in terms of its ability to open the door to the growth curve that comes with graphene production and utilisation technology, unconstrained by the normal physical parameters that come with mining. Positioning FGR in graphene's lowest cost quartile, and perhaps even the lowest cost decile, places the Company at the beginning of what promises to be an extraordinary growth curve.

Over the last two years FGR has made a number of detailed technical releases to the ASX concerning progress of the graphene initiative. While some of these have been too technical for most investors to understand, the Company has adopted a policy that it should nevertheless keep the shareholders and the market fully informed of the scientific basis for its enthusiasm on the graphene business, rather than rely on promotional bravado and generalisations. FGR aims to be as transparent as possible in its disclosure to the market. It prefers to report on progress achieved rather than promote aspirations and dreams i.e. under-promote and over-deliver.

Now that the Company has received all approvals necessary to construct and operate a commercial scale graphene production facility at its premises in the Perth suburb of Henderson, it is an appropriate juncture to release a detailed report documenting progress that has been achieved over the last two years, in preparation to becoming a world leader in the production of high quality, bulk scale graphene products. The Mission Statement concisely captures the graphene vision.

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1.0 Capability Statement

1.1 Current and Planned Production Capacity

At present FGR is capable of supplying graphene for customers that is produced from the prototype Graphene Cell, at a rate of approximately 10 tpa, depending upon how many shifts that Cell is operating. Sales to date have been in the nature of samples of not more than several kilograms, supplied to potential buyers for testing suitability of the product. Given that each application of graphene in manufacturing will have its own specifications and requirements, initial samples will usually be the first step in tailoring a client-specific product. In many cases the exact specifications will constitute part of the customers intellectual property, so there will be some confidentiality and caution in the process of designing a final, suitable product.

The graphene produced in a first pass exfoliation process will conform to the specifications in Table 1. Additional finishing steps may be used to adjust the size of the platelets and functionalise the graphene. To this end, FGR has secured the exclusive rights to the Vortex Fluidic Device (VFD) and the Turbo Thin Film Device (T^2FD) processing technologies, from Flinders University. These units are also expected to provide the potential to produce graphene and graphene oxide (GO) using water as the main solvent. This will be a significant breakthrough when compared to the Hummers Method, which is more complicated and expensive, involving the use of polluting chemicals.

With the decision to proceed with the construction of a commercial scale facility in the December half of 2017, the graphene production capacity will increase to a minimum of 25 tpa with a potential to produce up to 90 tpa, depending upon how many shifts will be operating. The production line will comprise a number of modular units so that actual production levels can be efficiently managed to match the sales contracts and minimise operating costs. Expansion beyond this capacity can easily be constructed at short notice, but the timing will depend upon the level of orders being received.

One of the key benefits of the modular process employed by FGR is the ability to install Cells on the factory floor of customers, rather than produce the graphene at a centralised location. This would minimise transportation costs of the finished graphene material and allow just-in-time delivery of graphene to the manufacturing process of the final, graphene-enhanced product. Given that graphene has a limited shelf life due to its propensity to re-agglomerate if left standing, just-in-time production offers the customers the ability to use pristine graphene in their manufacturing processes. Notwithstanding the benefits of location specific production capacity, FGR will maintain its Henderson facility as an essential installation that proves its capability, and as a site at which continued design improvements and R&D can be undertaken.

1.2 Product Description and Quality

A number of different scientific tools and methods are used to assess graphene product quality, which can vary enormously from one facility to the next. Strictly speaking, graphene is defined as being from 1 to 10 layers in thickness. Once this range is exceeded it becomes graphene nanoplatelets, being from 11 to 150 layers thick. End users may find that a true graphene product is necessary, but others may find that they are happy to utilise less specific graphene nanoplatelet or micro-graphite products to achieve the results they seek, particularly where there is an advantageous cost/benefit compromise.

Analysis by Raman spectroscopy and other techniques has shown that FGR's graphene is high quality with low defect levels. This is the direct result of our high grade feedstock and the elegant electrochemical exfoliation production method that is almost chemical free, using only dilute sulphuric acid and electricity in the process.

The industry is working with The International Organization for Standardization (ISO) to develop the standardised nomenclature needed to develop a universal specification sheet (ISO/TS 80004-13). There continues to be discussion regarding what parameters are the most important, with different applications needing specific properties. Table 1 provides information on FGR graphene from independent university testing facilities.

It is important to note that testing for graphene quality can vary according to the characterisation techniques used. Also, results can vary both within individual batches, and from batch to batch, due to the sample points being so small relative to the batch size. Any quoted figure is likely to be indicative rather than absolute. What is the most important test, at the end of the day, is how the graphene product works in the final application.

Specifications of FGR Graphene	
Parameter	**Measurement**
Description	Light grey powder
Process	Electrochemical exfoliation
Carbon Content	> 99%
Ash Content	< 1%
Particle Size	40 μm average
Surface Area	> 500m^2/g
Layers	1-7
Graphene Resistance	< 100 Ω
Electrical conductivity	Extremely high

Table 1: Specifications of FGR Graphene

The University of Adelaide has reported that FGR graphene demonstrates extremely high electrical conductivity with a resistance of less than 100 Ohm, which is between 17 and 50 times better than pristine graphene (1,700-1,900 Ohm) and reduced graphene oxide (5,000 Ohm). Furthermore, spraying of FGR graphene resulted in homogeneous distribution on sheets, whereas standard graphene formed clusters and therefore had lower conductivity. The University further confirmed the purity of FGR graphene with the release of the Table 2, below. The Raman shift curve in Diagram 1 provides further confirmation of the quality of FGR graphene with the sharpness of the G-band and a low defect band.

	Compound Name	Concentration (%)	Absolut Error (%)
1	C	99.97	
2	Mg	0.01	0.003
3	Al	0.01	0.003
4	Si	0.04	0.006
5	Cl	0.02	0.004
6	Ca	0.00	0.002
7	Fe	0.04	0.006

Table 2: Composition of FGR Exfoliated Graphene

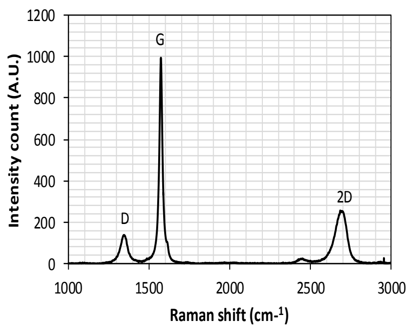


Diagram 1: Raman Spectroscopy of FGR Graphene

2.0 Timeline of Achievement and Targets

The following table provides an account of ASX releases covering achievements as evidenced by ASX releases, along the path to commercialisation of graphene.

Date of Release	Event
8 April 2015	Agreement with the University of Adelaide to test Sri Lankan vein graphite for suitability for conversion to graphene.
13 April 2015	Excellent test results using electrochemical exfoliation, showing high quality and low levels of defects in graphene from vein graphite.
11 August 2015	Graphene yields from vein graphite reach > 43.6%, with 90% of the exfoliated material being graphene.
2 September 2015	Scope of University of Adelaide work extended to the optimisation stage of the exfoliation process specific to vein graphite.
10 February 2016	Agreement to supply graphene from the University of Adelaide to enable testing for two parties in SE Asia and Europe.
13 April 2016	Further optimisation work increases graphene yield from 43.6% to > 80%, within 24 hours. Exfoliation achieving average platelet sizes of 30-40 microns, much larger than the 3-5 micron size achieved by CVD methods. Total graphitic recovery reaches 99.9% (graphene and graphene nanoplatelets). Recovery rates achieving 50% within four hours. Design completed for scaled up 250 litre processing unit, being commercial scale.
8 July 2016	250 litre, 5 tpa graphene production prototype production cell nearing completion.
2 September 2016	Successful commissioning of 250 litre graphene production cell, achieving 83% conversion to several layer graphene at platelet sizes of 45 to 78 microns.
28 September 2016	Collaboration agreement (MoU) with Flinders University covering the commercial development of the Vortex Fluidic Device (VFD) and Turbo Thin Film (TTF) processing technology, to be used in secondary processing of FGR's graphene.
21 October 2016	Licence agreement received from the University of Adelaide relating to a multi-purpose graphene-based fire retardant, giving a world-wide licence with the right to sub-licence the technology in return for a royalty.
1 November 2016	Successful production of graphene nanostructures and scrolls (similar to carbon nanotubes) using the VFD and TTF technologies, with Flinders University, from graphite in a water-based solution.
7 December 2016	Long term vein graphite supply agreement with Kahatagaha, the Sri Lankangovernment mine for up to 1,000 tpa, to be used as feedstock for the Graphene Cell.
15 December 2016	FGR graphene showing itself to be much better than other graphene with tests confirming very high conductivity of FGR graphene with resistance of less than 100 Ohm, being 17-50x better than pristine graphene and RGO. Also, it performed very well in spraying applications, achieving homogeneity of distribution whereas standard graphene gave clusters. Fire retardant licence signed with the University of Adelaide.

19 January 2017	Binding HoA signed to advance and commercialise new generation supercapacitors with Swinburne University of Technology, using graphene oxide, named the BEST Battery (Bolt Electricity Storage Device).
14 March 2017	Provisional patent application lodged for the Graphene Cell technology.
22 March 2017	Technical due diligence on the BEST Battery satisfactorily completed, concluding that Swinburne University is on the leading edge of science with the Battery showing much greater energy density.
29 March 2017	Samples of graphene being dispatched to potential customers in the fields of automotive manufacturing, aeronautics, paint manufacturing and polymer producers. Quality of FGR graphene confirmed with particle sizes averaging 40 microns, surface area being > 500m^2/g and thickness being 1 to 7 layers. Announced concept of modular production units to be installed in customers' factories for just-in-time delivery of graphene.
26 April 2017	Strategic market alliance announced with Traxys for sale of graphene products, with Traxys taking equity-based remuneration for better leverage to the graphene revolution.
4 May 2017	New 960 m^2 premises leased in Henderson, Perth, for a dedicated graphene production and packaging facility.
8 May 2017	Optimisation giving better capacity of Graphene Cell, doubling to 13 tpa on double shift production runs.
16 May 2017	BEST Battery agreements finalised with ability to earn 70% of private company that has licencing rights in leading industrial countries.
29 May 2017	Work commencing on BEST Battery. Documentation lodged with WA Government to seek approvals for graphene production facility.
12 July 2017	Government approvals received for Henderson graphene production facility.
17 July 2017	FGR signs as Tier 1 industry partner in Australian Research Council Hub for Graphene Enabled Industry Transformation. The focus will be on development of fire retardants, conductive coatings and polymer composites, all using graphene.
28 July 2017	Update on retardant testing with University of Adelaide, showing the product to be superior to existing fire retardants in the areas of self-extinguishing ability, suppression of toxic and flammable volatiles, oxygen barrier effect and retention of mechanical strength.

Table 3: List of significant ASX announcements relating to the graphene division of FGR to August 2017

The priority targets for the next six months are listed below:

- Construction and commissioning of the Henderson commercial production facility
- Achieving first repeatable graphene sales contracts
- Production of graphene from VFD and TFD
- Production of graphene oxide using the FVD
- Construction of the first BEST Battery™ prototype for demonstration purposes
- Scaling up of field trials for the FireStop™ fire retardant
- Continuing vein graphite development in Sri Lanka

3.0 Development of the Graphene Process Route

3.1 Test Work Undertaken by the University of Adelaide

First Graphite first commissioned the University of Adelaide to test Sri Lankan vein graphite for its suitability for the production of graphene in May 2015. The University reported that of the approximately 50 different ore types that it had tested, the graphite supplied by FGR had given the most impressive results. FGR then engaged with the University to conduct further test work with a view to establishing a commercially viable process for the production of graphene for industry.

Following extensive laboratory test work in continuous runs of up to 24 hours, in which the University tested the process under a variety of conditions regarding power consumption, electrolyte concentrations, agitation methods and flow rates, an interim optimized process design was formulated.

FGR announced in April 2016, that it was successfully producing very large graphene platelet sizes averaging 3-40 microns, and up to 100 microns. Significantly, the yield from graphite to graphene was 80%, which the University advised was an order of magnitude better than that being achieved by other companies that used lesser grade ore. The process enabled the Company to produce a 99.9% concentrate of graphitic material that comprised of mostly graphene but included minor amounts of graphene nanoplatelets.

Gravity separation of this concentrate resulted in three distinct categories of material:

i. Upper Layer, > 99.5% graphene with traces of small, graphitic nanoparticles
ii. Middle Layer, 97-98% graphene
iii. Lower Layer, incompletely exfoliated graphitic particles

Applying a secondary processing step demonstrated that the small graphite particles could be removed or reduced to enhance the quality.

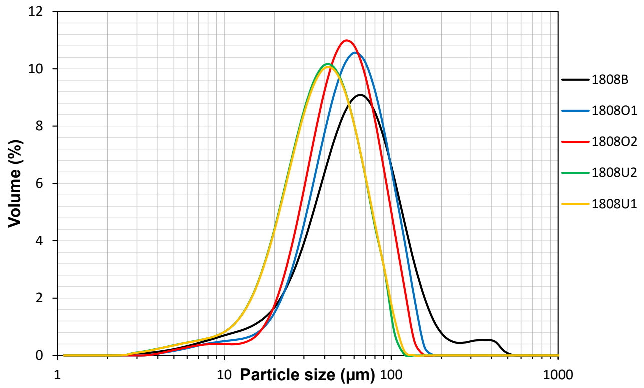
As part of the process design program, characterisation methods to test the quality of the graphene included SEM, EDAX, XPS, XRD, Raman, TGA, particle size measurements, 4-probe conductivity and optimal microscopy. Optimisation and simplification of the quality assurance process has been an ongoing exercise in order to capture the most critical quality parameters.

Diagram 2: Initial graphene recovery from 2.5 litre cells at University of Adelaide (April. 2016)

3.2 Graduation to Prototype Commercial Scale Production Cell

Encouraged by the results from work undertaken by the University of Adelaide on the bench scale 2.5 litre capacity test cells, FGR commenced the design and fabrication of a full size, 250 litre production cell, in order to confirm the scalability of the production process. An agreement was negotiated with *Nagrom the Mineral Processor* to use its facilities in Perth.

FGR commenced commissioning of the Graphene Cell in mid-August 2016. On 2nd September it reported good initial performance of the Cell, achieving up to 83% conversion to graphene and large platelet size of between 45 and 78 microns, as demonstrated in Diagram 3 below.



Unsorted Product Sizing

	Average Particle size (μm)	% Graphene
1808_B	78	22
1808_O1	65	58
1808_O2	59	53
1808_U1	45	75
1808_U2	55	83

Diagram 3: Graphene Platelet sizes from early stage commissioning of the Graphene Cell (Sept. 2016)

Diagram 4: The Graphene Cell during commissioning (Sept. 2016)

Having demonstrated the initial scalability of the production process, FGR continued on with a program of characterisation and purification of the product, and general optimisation of the Cell parameters. While the Company could have in theory supplied samples of its graphene product to industry at this juncture, the decision was made to concentrate on improving the quality of the product before doing so.

3.3 Progressive Improvements in the Graphene Cell

FGR has continued to achieve excellent improvements in the operation of the Graphene Cell as it tinkers with its configuration. By mid October 2016, it was reporting that the purity of the product had increased to 96%. Research continued to optimise the mix of power and electrolyte, along with development of the methodology of screening, washing and drying of the graphene product. Yield of graphene from the vein graphite frequently exceeds 90%, depending upon a number of production parameters. This yield is believed to be the highest in the world by a significant margin and it does not include graphene nanoplatelets in this figure.

3.4 Benefits of the Graphene Cell Design

The size of the Graphene Cell was specifically designed in order to provide a significant capital cost advantage when compared to alternative methods of producing bulk graphene. Rather than be dependent upon a central processing facility from which graphene products can be shipped around the world, the Cell offers the flexibility of being able to be located in the factories of graphene customers for just-in-time manufacturing and delivery of graphene. Not only does this make for efficient inventory management, it also ensures that the graphene is of pristine quality when it is added to the material that is being enhanced.

Another benefit of being located on the factory floor includes the avoidance of transportation costs. It is much cheaper to transport the graphite ore to the place of conversion into graphene than it would be to ship graphene itself. If the graphene were shipped in an aqueous solution it would normally be a maximum of 5% graphene and 95% water, which is expensive to transport. If the graphene was in powder form you would find that the swell factor is enormous, with graphene having a specific gravity of around 0.008 i.e. a 20 foot shipping container could only house approximately 250 kilograms of graphene, whereas the same container could hold 20 tonnes of graphite.

The low capital cost of a Graphene Cell provides an enormous competitive advantage. Being modular, there is no need to construct a single, expensive production facility. There is no need to finance and spend large sums of money on production capacity, with the dilution of shareholders' equity in the process. Production capacity can be added as and when required, in parallel to the receipt of orders from customers. Table 4 below summarises the different methods of manufacturing graphene. FGR's electrochemical exfoliation process places in the highest quality category according to this table.

Method	Approach	Product Type	Flake Sizes	Chemical Purity, Structural Uniformity
Liquid Phase Exfoliation	Top-down	GNP, MLG	300-50,000nm	good
Graphene Oxide Reduction	Top-down	vFLG	3,000-20,000nm	below average (high at wt% O_2 content, structural defects
Electrochemical Exfoliation	**Top-down**	**vFLG**	**500 -10,000nm**	**very good**
Direct Chemical Synthesis	Bottom-up	FLG, vFLG, MLG GNP	20-6,000nm	good (some low level metal impurities)

Table 4: Main methods of making graphene.

Key: GNP=graphene nanoplatelets, MLG=multi-layer graphene, FLG=few layer graphene, nm=nanometers

3.5 Competitive Position Regarding Other Potential Graphene Producers

It is difficult to be precise about where FGR stands vis-à-vis competitors in the graphene space, with respect to real and potential competitors, due to incomplete disclosure by almost all of the other operators. There are frequent examples of companies making statements of what they can, and what they intend to do, but without any real supporting evidence of capability. The lack of back-up evidence may be an immediate cause for skepticism, and investors should not assume that everything that is said in a promotional mode is entirely accurate. Having aspirations is not the same as actual delivery. Further, there will often be some level of caution regarding the extent of disclosure where there is a risk that a company may give away competitively sensitive information, but investors need to assess the real reasons for truncated information flows on a case by case analysis.

3.6 Provisional Patent Lodged in March 2017

In March 2017, FGR announced that it had lodged a provisional patent covering its graphene manufacturing process and equipment. It is seeking to benefit from the international conventions that enable an application to be lodged initially in one country, then to be followed up by other applications within a defined time limit (generally 12 months).

3.7 Efficient Use of Shareholders Funds

FGR shareholders should be pleased with the fiscal efficacy with which the Company has undertaken its graphene initiative, achieving significant milestones without spending much money at all. In May 2015, after learning from the University of Adelaide that the Sri Lankan graphite gave better results than all of the other graphites tested (approximately 50), FGR committed to a long term R&D project with the University. After almost 12 months and $273,000 of expenditure, FGR decided to accelerate the program and go straight for a 250 litre capacity cell. While there was some risk in scaling up from a 2.5 litre bench top scale to a 250 litre size, as relationships in the process are not linear, FGR decided to depart from the gradual approach which would have added another year to the program with commensurate costs. (Note that the expenditure was eligible for an Australian Federal Government Research and Development refund, which at a rate of 45%, resulted in the net cost to the Company of this total research program being approximately $150,000).

The design, construction and commissioning of the 250 litre cell was undertaken by FGR in Perth, rather than at the University. The first version of the Graphene Cell was commissioned in September 2016, with a nominal capacity of 5 tpa of graphene, on a budget of less than $100,000. Subsequent to that commissioning, the Company has spent another $100,000 on R&D and design improvements that have lifted the capacity to 13 tpa. Thus, total direct expenditure on the graphene project to this date, including University costs, has been less than $500,000. The Company contends that this is the most cost efficient outcome of any company developing graphene capacity, anywhere in the world.

4.0 The Vertical Integration Strategy

Although FGR was initially a company aiming to develop and operate vein graphite mines in Sri Lanka, extraordinary test results from conversion of the graphite to graphene have caused an evolution into the full spectrum of the graphene value chain, such that the graphite itself is the door opener to much greater profitability downstream.

While graphene is currently selling at very high prices today, a realistic assessment of the future market should acknowledge that as more producers enter the market the price will probably fall. As it falls it will become more economically viable for industry to use graphene and total demand will correspondingly increase. Graphene producers will experience shrinking profit margins but it will be a tradeoff between margins and volumes, such that low cost producers who can expand output will probably experience improved profits. Higher cost graphene producers will become casualties of the changing dynamics in the market for graphene.

As a market for any product becomes commoditised and it becomes a quest to be the lowest cost producer, it makes sense for a producer of that commodity to move further down the value chain to where the strongest growth is being stimulated by the lower costs of input materials. That is the rationale behind FGR seeking exposure to applications and associated IP. Having royalties and licencing agreements takes the business beyond physical constraints of production capacity into the more lucrative long term growth curve that we can expect with the greater penetration of graphene-based products in industry.

4.1 Vein Graphite Mining and Supply

The graphite is still the essential raw material that enables such impressive capabilities on the graphene side of the business. With run-of-mine grades of 95-99% TGC, vein graphite is significantly more productive in the conversion process to graphene than any other source of graphite in the world. That competitive advantage flows through into subsequent downstream processing steps.

The small-scale underground mining operation in Sri Lanka will always be challenging owing to cultural, regulatory and workforce related issues. Recognising this reality, FGR has adopted a dual approach to source the graphite by also securing an exclusive off-take agreement from Kahatagaha, the Sri Lankan government owned graphite mine. FGR's own mines will continue to be ramped up for a number of years with the rate of expansion being dependent upon the need for raw materials for the graphene conversion process.

FGR can sell its graphite production to the end user market with strong profit margins, given the budgeted all-in-sustainable-costs in the order of US$700-$800 per tonne of saleable ore, and a market price of around US$2,000 pt. However, it can create much greater value by downstream processing, including conversion to graphene. The value uplift should be significant with selling prices of US$10,000 to US$100,000 pt, depending upon the final product. It would be prudent to build stockpiles of vein graphite ahead of anticipated demand for graphene, though in the early stages there is likely to be a mixture of sales of graphite and graphene.

4.2 Graphene and Downstream Processing Activities

Rather than pursuing a long life small-scale mining operation, FGR is seeking to gain leverage and higher profit margins from value adding activities of downstream processing. The opportunity from graphene is covered throughout this report. It promises the greatest upside potential, conservatively estimated to be at least 10x more profitable than just supplying graphite to customers. As an embryonic industry, analysis of graphene manufacturing and application opportunities is more about possibilities than certainties. Thus there is still a highly speculative nature to the business. Nevertheless, the possibilities are unbounded.

Independent of the graphene side of the business, there is good opportunity to take the vein graphite and further process it to make advanced graphite products. The unique nature of the graphite and the very high grade provides specialized opportunities. There is reason to believe that much of the vein graphite sold by existing producers is taken to downstream processing facilities in Europe and North America. There is no reason why this can't be done by FGR, and perhaps it can be done in Sri Lanka itself. Of course, buyers of specialist products will need to be identified beforehand.

4.3 Applications and Intellectual Property (IP)

FGR is also pursuing a third level of earnings from the graphene value chain. That is the development of applications for graphene and intellectual property. On a basic level it makes sense for FGR to stimulate research and commercialisation of applications, as it will lead to increased demand for graphene products. Intimate involvement at this level will assist FGR in better understanding exactly what graphene products are required by industry, thereby enabling it to better meet the demands of customers. This is all about staying ahead of the competition through interaction with the market.

At the same time, the development and proving of IP will give access to royalties and income streams that will grow over time with increasing market penetration. The sale of licences to use processes may be another source of income. These sources of income will not be constrained by the physical parameters that limit mining operations.

The Graphene Value Chain

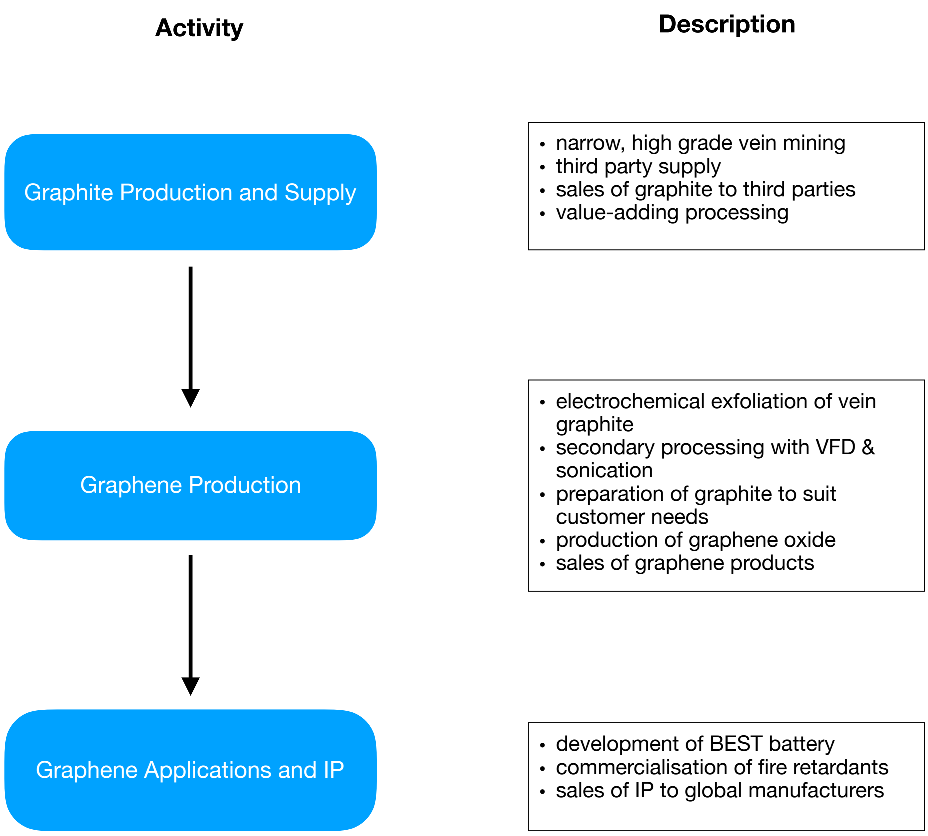


Diagram 5: The Graphene Value Chain

5.0 The Two Leading Applications with Global IP

The previous section explained the strategy behind the vertical integration into the development of applications and IP. On a basic level the research and development will expand the marketing opportunities and stimulate graphene sales, but it will do much more than that. It will be building intellectual property and creating value from licences that could ultimately be the strongest profit earner for the company. Raw material production, and even manufacturing itself, will increasingly become commoditised. Look at how China has brought down unit costs in manufacturing right across every sector and become the lowest cost manufacturing centre for global markets. In the future having patents and licences will the best way to maximize profits.

5.1 Fire Retardant – FireStop™

Fire is a devastating disaster for our society, causing loss of life, damaging the environment and significant financial loss. In the United States alone economic loss from fire is estimated at US$600bn p.a., or approximately 2.1% of GDP. In Australia, the numbers are estimated at $15 bn or 1.3% of GDP. The recent tragedy in Grenfell, in the UK, has amplified the concerns emanating from fires and ineffective fire retardants.

Fire retardants currently used throughout industry rely on toxic halogen, organic-based ingredients. These create environmental problems such as soil and water pollution. Many are mutagenic and carcinogenic and have been banned in some countries. Industry is actively looking for better alternatives as regulatory standards are being tightened.

One of the main causes of damage by fire on many materials is the intumescent effect, whereby these materials swell on exposure to heat, causing expansion and a destruction of the structural integrity of the material. The material starts to break down, causing the release of flammable and toxic gases. As the process continues there is an increasing danger of structural collapse, even with the use of existing retardants that may slow down the reactions. The test work with graphene has demonstrated an effective barrier to oxygen in the first instance, which is one of the three key elements needed for a fire. The restricting of a fire's access to oxygen reduces its intensity and limits the generation of heat, thereby minimising the intumescent effect.

Having proven graphene-based retardants work well, FGR and the University of Adelaide are continuing with research into the practical aspects of applying these coatings and optimising developed formulations. Importantly, as it comes down to ease of use, the graphene-based retardant can be easily applied with a spray or a brush. Its flexibility makes it suitable in the protection of cellulosic, plastics and polymers as well as wooden structures. It is effective and fit for purpose in significantly smaller concentrations than existing retardants. It is not difficult to manufacture and does not require expensive capital equipment.

As well as economic benefits offered to manufacturers and end users, this new generation of fire-retardants offers better fire-protection and strong environmental benefits to society. Fires will generate less toxic gases, reducing pollution. The carcinogenic and mutagenic effects of existing retardants will be circumvented.

There appears to be no obvious impediments to the commercialisation of these new types of fire-retardants once government standards and ratings are satisfied. Different application and materials will be subject to varying compliance regimes depending upon whether the retardant is used for consumer products or those that have implications for building codes. Each state and each country will have its own set of rules.

A graphene-based fire-retardant could become the new generation of fire resistive coatings and fire retardants. The graphene technology would provide a four-fold benefit:

1. Oxygen barrier effect and water vapour release (which would mitigate flammability)
2. Self extinguishing ability (so it would not be a flame propagator)
3. Restraining structural collapse (the mechanical strength of graphene would assist in maintaining integrity)
4. Toxic and flammable volatiles suppression (which would assist rescue efforts)

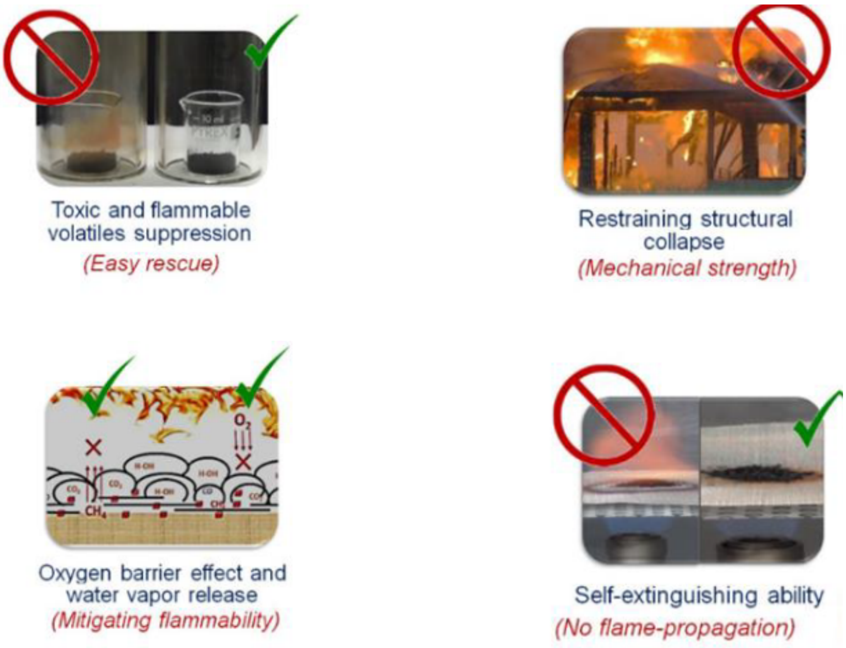


Diagram 6: Benefits of Graphene-based Fire Retardants

A video demonstrating the benefit of the graphene based fire retardant can be viewed on the Company's YouTube channel at https://youtu.be/v82SrC72R0s. The butane flame, at approximately $3,000^0$ C, is applied to the wood, one untreated and one treated with the graphene fire retardant. The results are dramatic.

5.2 The BEST Battery – Going Beyond Lithium-Ion and Problems with Chemistry

The fundamental operating principle of the lithium-ion battery, a leading rechargeable energy storage device, involves movement of lithium-ions into the recesses of a graphite-based electrode (anode) when it is charging. When it is discharging, these ions move back through a liquid electrolyte to a more complicated electrode (cathode) made of compounds containing lithium and other metals.

Lithium-ion technology is the established method, but it is acknowledged that lithium-ion batteries are potentially dangerous. Authorities in Australia are sufficiently concerned that they propose strict new standards for the housing of lithium-ion batteries in domestic locations where residents are seeking to install battery walls. They specify that these walls should be stored in concrete bunkers separate from the home. Maybe these regulations are too tough and there is room for them to be relaxed a little, but the point to remember is that lithium-ion, as a chemical based battery, presents ongoing safety issues. We need to move on to better technology.

The obvious better technology involves physical storage of energy as opposed to electricity from chemical reactions. That takes us to supercapacitors. These devices are much safer as there is no chemical reaction that can lead to fires and explosions. It is simply a matter of filling up the reservoir by plugging it into the power point, and this happens in a fraction of the time that it takes for existing rechargeable batteries. A mobile phone could recharge in 30 seconds rather than an hour or two. A Tesla car might take only five minutes to recharge. There could also be weight savings of up to 75% due to the absence of metals.

The key to new supercapacitors is the use of graphene. Existing supercapacitors use activated carbon to house energy, but that material has poor interconnectivity of spacing and in reality only achieves 10% of the potential storage capacity. The BEST battery being developed by FGR and Swinburne University of Technology overcomes this problem by using graphene oxide (GO) and reduced GO to create nano-pores, using laser technology that enable 10x the storage capacity of existing supercapacitors. Thus they can now compete with lithium-ion storage but with much faster charging rates. Also, they will last at least 10-20x longer as there is no chemical reaction to degrade cathode or anodes. This promises to be a serious game changer.

We know the science works in the laboratory. The current work program involves the construction of a working prototype AA battery for demonstration purposes, hopefully by the end of 2017. The focus will be on designing manufacturing methods so as to ensure a reasonable unit cost, in scale.

So far the market doesn't seem to understand the risk reward ratio for the BEST battery - the outstanding leverage available to FGR. The Company is committed to spending up to $2m to earn a 70% interest in the global licence, but almost half of this could come back in the form of R&D rebates. What would a manufacturing licence be worth for a product as good as this one promises to be? How about $1bn as an opening bid? Given that Samsung dropped about US$5bn on its recent Galaxy 7 battery fiasco, US$1bn would be a small price to pay. Would that be the only licence that could be sold? Probably not.

We are all gamblers in the stock market, to a lesser or greater extent. Decisions should be made based on the risk reward equation. Here, FGR is effectively risking no more than $2m for the potential to earn $1bn. You can use your own probability factor, but even a 10% chance of success gives the company a 50x return on its investment. The optionality value is clearly exceptional. Yet, it is still just another example of a number of graphene-based initiatives that make the stock a compelling opportunity.

Table 5 shows a comparison of the BEST Battery™ with a typical rechargeable lithium-ion AA battery available in the market, based upon research undertaken by the Swinburne University of Technology in Melbourne.

Parameters	Supercapacitor (BEST Battery)	AA Rechargeable Battery
Storage mechanism	Physical	Chemical
Charge time	1-10 seconds	1 – 4 hours
Cycle life	Minimum 10,000 cycles	300 – 1,000 cycles
Cell voltage	1.5 to 2.3 V	1.25 – 1.5 V
Energy density (Wh/L)	5 (current state) 50- 60 (target for this project)	100 to 200
Power density (W/L)	Up to 10,000	35 to 300
Cost per Wh	$20 (current state) $0.30 (target for this project)	$0.50 - $1.00 (large system)
Service life	10 to 15 years	1 to 2 years
Disposal	No special need, environmentally friendly	Land fill, harmful to environment

Table 5: Comparison of the BEST Battery™ with Lithium-ion.

Diagram 7 shows the significant improvement of the BEST Battery™ compared with existing supercapacitors. The current supercapacitors, shown as the pink oval, fill the middle ground. They have much lower energy density (the total energy stored in a battery – the reservoir) than lithium-ion batteries, as measured on the vertical axis. The horizontal axis measures the power density, being the rate at which energy can flow into or out of a battery. The BEST Battery™ measurement is indicated by the red star. It shows an energy density almost as good as that of lithium-ion, but the power density is dramatically better. That is where the rapid chargeability is measured. The objective of the current work is to construct working prototypes of AA batteries for demonstration to global battery manufacturers.

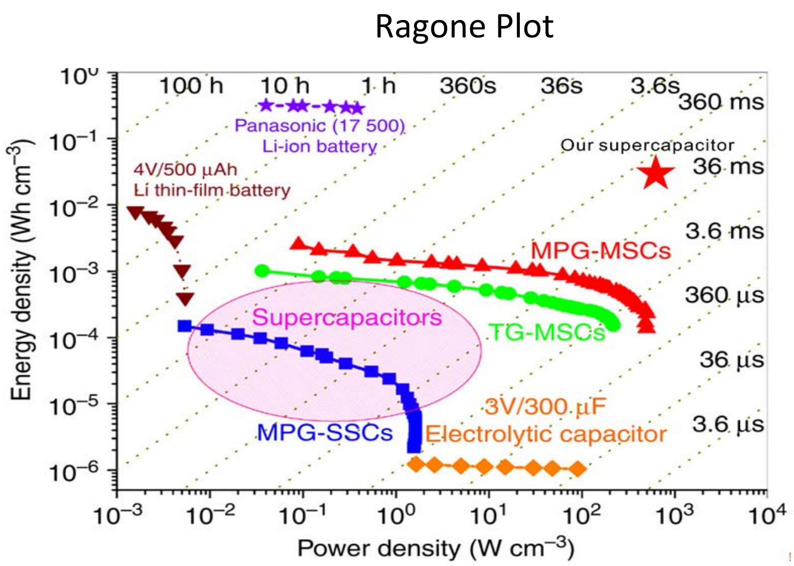


Diagram 7: Ragone Plot showing the BEST Battery in the top right hand quadrant
Source: Swinburne University of Technology

6.0 Establishment of the Henderson Graphene Production Facility

When FGR embarked upon the development of the Graphene Cell it made use of the Nagrom facility, which was conveniently made available at almost zero cost. Having achieved excellent results over a 12 month period, it became necessary for the Company to acquire its own premises due to the need for larger capacity and better security. It committed to the Henderson site in May 2017, taking a 5 year lease on the 960m^2 building. This gives the Company the space needed to stockpile its vein graphite as well as capacity to establish commercial scale graphene production lines with associated finishing and packaging functions. It will also house the Company's administrative personnel.

All necessary works approvals were received from the WA Department of Environmental Regulation (DER) in July 2017, following the lodging of a 70 page application that addressed a range of regulatory requirements that covered materials handling standards, OH&S requirements and emission controls standards. It is a pleasing feature of the process being employed by the Company that it does not involve the use of toxic substances or dangerous chemicals that are subject to any special regulatory controls or safety standards. It is an environmentally safe process.

The approvals will enable the construction of a commercial scale graphene production facility with capacity of between 25 and 90 tpa of graphene, depending on the number of shifts in operation. Importantly, this capacity can be achieved on capital expenditure of less than $1m, which is believed to be the lowest capital cost for any commercial graphene production capacity in the world. The Company will be able to fund the construction from existing cash resources. There is sufficient room at the site to be able to expand the level of operations at a subsequent date. The facility is expected to be commissioned by the end of 2017.

Diagrams 8, 9 and 10 below show a photograph of the exterior of the building, the dimensions of the floor plan and the configuration of the production equipment respectively.

Approval has now been received to construct a Commercial Graphene Facility at FGR's premises in the Australian Marine Complex, Henderson

Diagram 8: The Henderson premises in Fremantle

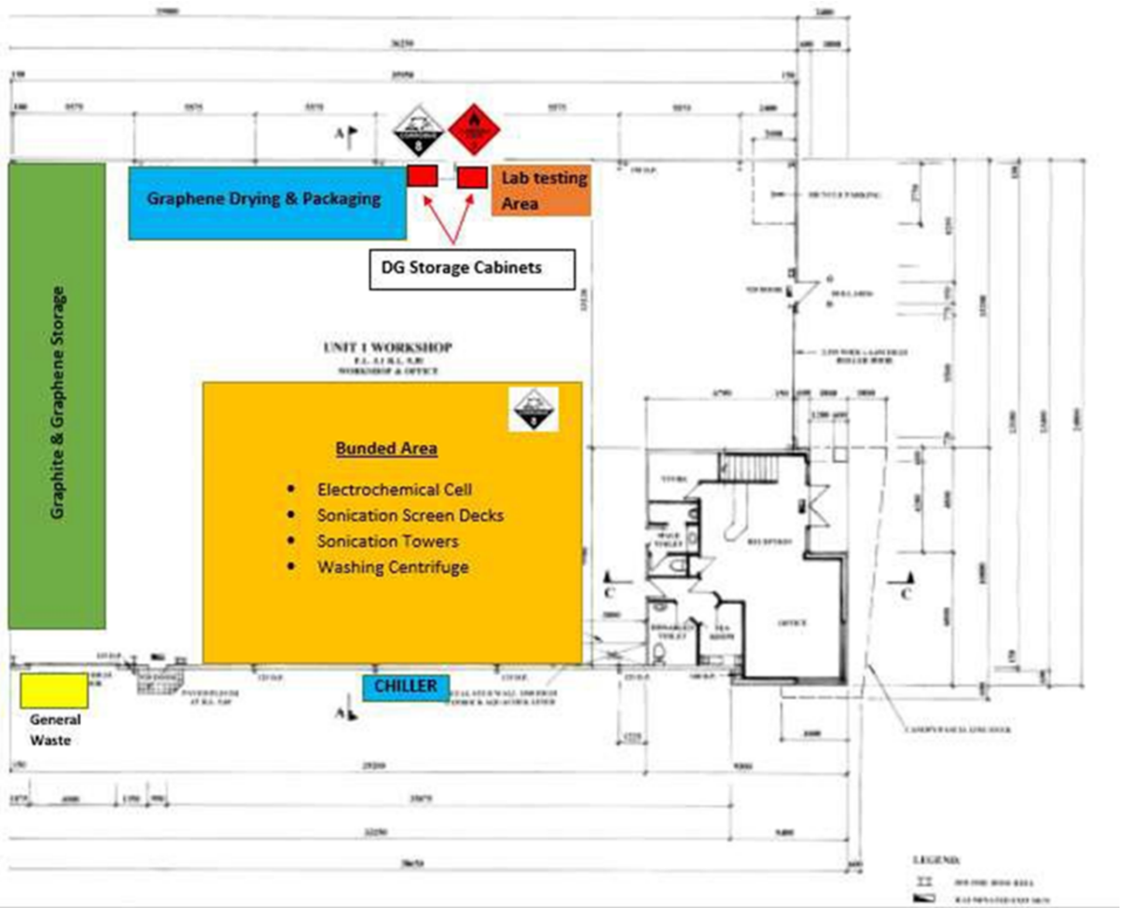
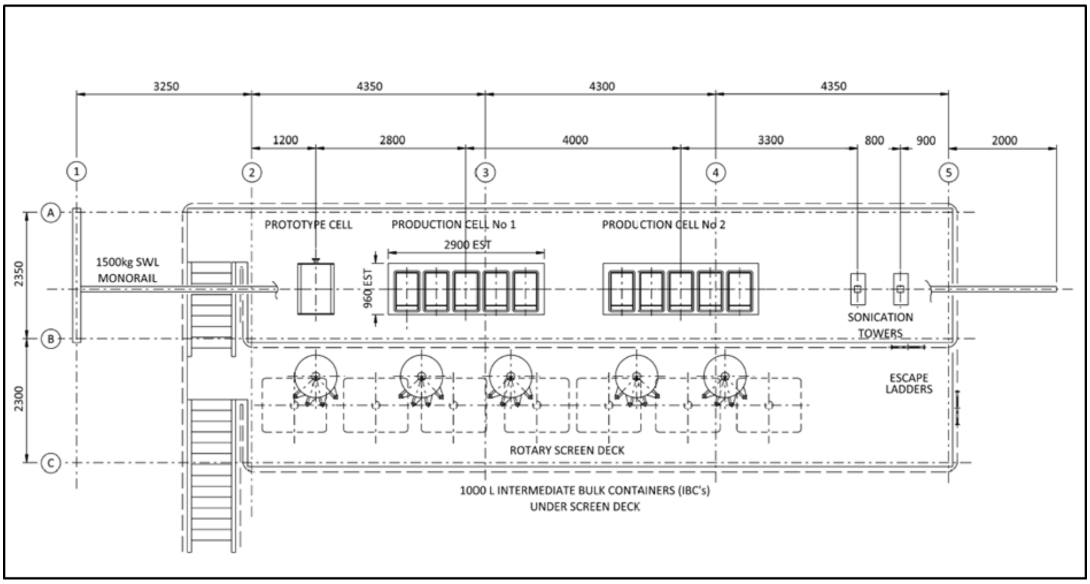


Diagram 9: Layout of key infrastructure for the Henderson Commercial Graphene Facility



Graphene Cells, Prototype & Production Plant Layout

Diagram 10: Proposed Graphene Cells, Prototype and Production Plant Layout at Henderson

7.0 Marketing and Sales

7.1 The Graphene Market Generally

The graphene market is embryonic, with most of the activity undertaken to date being in universities and research houses. Industry is only just starting to take graphene into commercial processes and products and it tends to be very careful about circulating commercially sensitive information. Consequently, there are not yet reliable paths of data collection and dissemination that observers can utilise for business planning purposes and industry analysis.

The Graphene Council is probably the most reliable source of information at this juncture, with the 2016 Industry Survey being the most recent publication. Diagram 11 below provides useful insight into the issues that are perceived to be holding back the wide scale commercialisation of graphene, with the cost, the scale of production and the quality being the greatest concerns.

FGR is well positioned to provide solutions to all of these issues. The low capital cost and low operating costs of its production technique, with the modular and scalable process, comprehensively address the first two concerns. The process also enables production of the largest graphene flakes with the lowest level of defects, as recorded with Raman spectroscopy analysis.

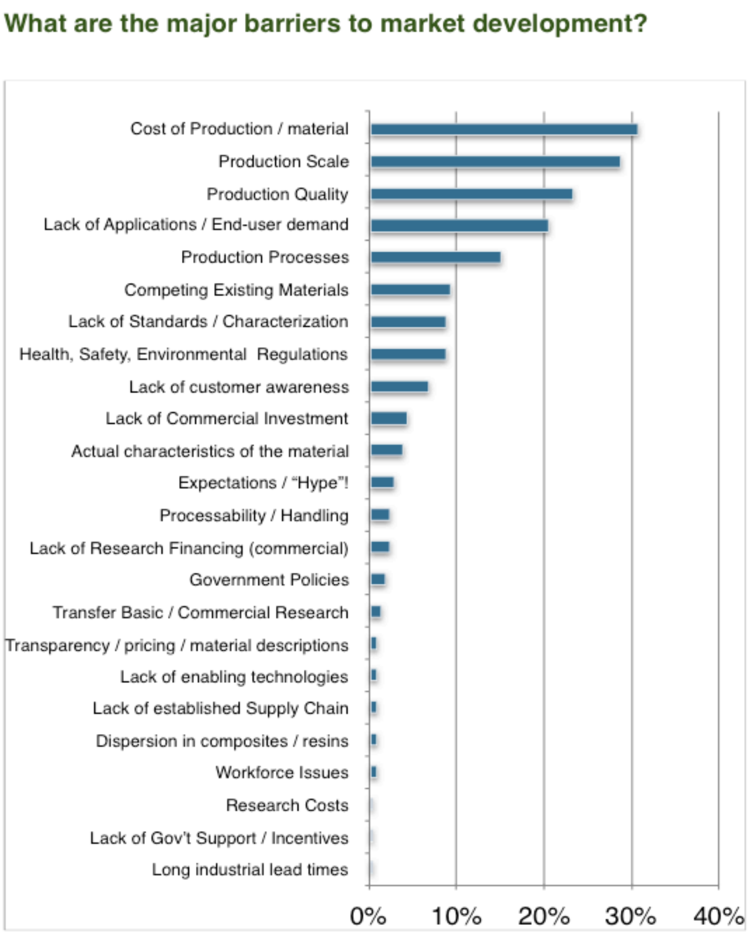


Diagram 11: Perceived Barriers to Graphene Market Development. Source: The Graphene Council

Fullerex is a broker to the graphene sector. In a recent publication it provided its estimate of expected market demand for graphene, shown in Diagram 12. Fullerex is looking for annualized growth of 20-60% from a level of $40-50m, the estimated size of the market in 2016. It says that the market was 150-250 tonnes in 2016, but other industry commentators have estimated a much larger market in the range of 700-1,000 tonnes. One of the issues is whether the graphene included in the numbers is truly graphene, at 10 layers or less in thickness, or graphene nanoplatelets i.e. micro-graphite, at 11-150 layers in thickness. Some industry operators either deliberately or inadvertently confuse the two in their attempt to bolster their importance. Diagram 13, also from the Fullerex presentation, shows that composites will be the greatest source of demand for graphene.

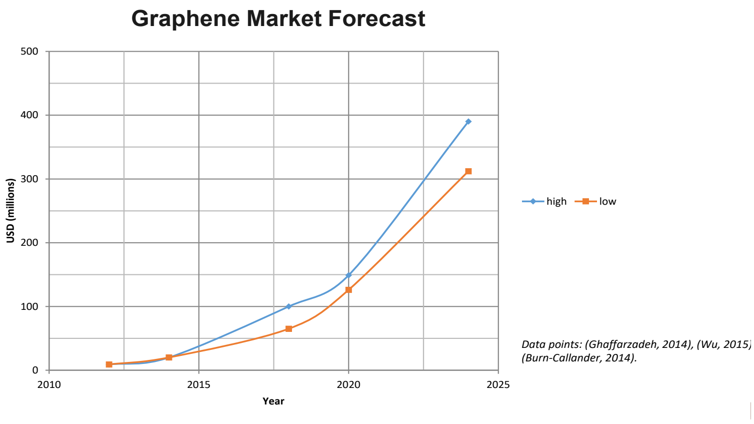


Diagram 12: Anticipated Graphene Market Growth. Source: Fullerex presentation

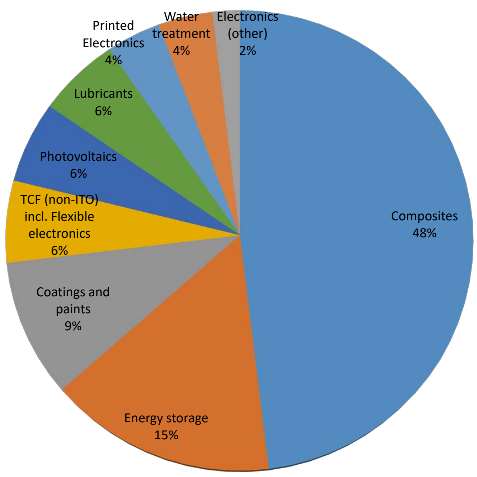


Diagram 13: Expected Sources of Demand for Graphene. Source: Fullerex presentation

7.2 First Graphite Marketing Arrangements – The Traxys Connection

The Company acknowledges that it has no marketing experience in graphene specifically, and it understands that the marketing of industrial mineral products is a very specialized field. So, it has formed a strategic marketing alliance with Traxys, a specialist commodity trader based in Luxembourg, with operations in over 20 offices around the world, employing over 300 employees. In its capacity as an agent, it handles in the order of US$6bn worth of sales across a broad range of commodities that includes base metals and their concentrates, minor and alloying metals, industrial minerals and chemicals, materials for steel mills and foundries, and uranium. Traxys is privately owned with its principal shareholders being the global alternative asset manager, The Carlisle Group *(NASDAQ:CG)*, affiliates of Louis M. Bacon, the founder, Chairman, CEO and principle investment manager of Moore Capital Management, LP, and Traxys Management.

FGR is pleased to be working closely with Traxys, one of the world's largest specialist commodity and material trading organisations in the development of the graphene market, from its inception. The strategic agreement with Traxys is expected to significantly accelerate FGR's market penetration and exposure whilst allowing FGR management to concentrate on the production of materials for sale.

Though the terms of the agreement with Traxys are subject to standard confidentiality clauses, the Company can disclose Traxys will be taking a substantial element of its remuneration in shares and options in FGR, based on a range of performance-based sales criteria. Thus, the future of the parties will be closely aligned with the best interests of FGR stakeholders.

7.3 Graphene Pricing

Just as there is uncertainty regarding supply and quality of graphene, there is also uncertainty regarding pricing. Some commentators say that the price needs to fall by 90% to be commercial, but such statements are more in the nature of generalist comments without detailed supporting analysis. In fact, from discussions with industry, price is not as big an issue as some people would think. That said, the cheaper the price, the less resistance there will be to the employment of graphene.

Commoditisation of graphene is a while away. What is more important than price alone is the type and quality and whether it is fit for purpose. Having established that it is suitable, the actual price that buyers are willing to pay will depend upon how well the enhanced products work, what improved efficiencies can lead to better positioning in the market for the end product and what the competition is doing. The pricing of graphene is unlikely to be on a cost plus basis for some time due to the need for specialist functionalizing of graphene. Prices are going to be by negotiation and confidential agreement for the foreseeable future. Where companies are involved both in the manufacturing of graphene and the production of the graphene-enhanced product, there will be a good degree of opaqueness around the pricing model of graphene itself. This will be one of the benefits available to FGR as a vertically integrated graphene company.

Table 6 provides indicative prices for different layers of graphene, from very few to multi-layered graphene and graphene nanoplatelets (which are technically micro-graphite, not graphene, as they exceed 10 layers). FGR production processes will focus on FLG and vFLG, being the higher value products. Note that vFLG is listed at 10x more than graphene nanoplatelets.

Order size (kg)	GNP	MLG	FLG	vFLG
1	$200	$200-$250	$800-$1,000	$1,750-$2,000
10	$90-$130	$100-$150	$400-$500	$1,250-$1,500
100	$50-$100	$60-$120	$300-$400	$1,000
1000	$30-$50	$40-$60	$100-$250	$750

Table 6: Main methods of making graphene. Key: GNP=graphene nanoplatelets, MLG=multi-layer graphene, FLG=few layer graphene, vFLG=very few layer graphene, nm=nanometers

8.0 Building the Technical Skill Base

FGR commenced its graphene initiative with executives that were more experienced with mining than with nano-materials handling. Nevertheless, the small team of executives was able to embrace a steep learning curve whilst working with specialist scientists at the University of Adelaide and other similar institutions.

The Company first appointed a metallurgical scientist named Dave Bennett, in the position of General Manager – Process Operations. Dave was trained as a metallurgical scientist, with industry experience being gained in businesses involved in drilling fluids for the oil and gas industry, where he rose to senior management positions. His first task with FGR was to oversee the construction and commissioning of the prototype Graphene Cell that was initially housed at Nagrom's facility in Perth.

More recently a chemical engineer has been appointed to the staff; John Paul Marzan. John Paul has more than 10 years experience in developing, commissioning and operating treatment plants in the mining industry, principally in the area of nickel recovery. He has worked on projects for Direct Nickel, Sumitomo Metal Mining Company, BHP Billiton, Hatch Engineering and Jacobs Engineering. He will be primarily responsible for the construction and commissioning of the Henderson graphene production facility.

Finding personnel with genuine graphene experience is a major challenge for any organisation, especially in Australia. FGR has been very fortunate to be able to secure the services of a leading graphene specialist based in the UK. For reasons of confidentiality his name cannot be disclosed as he works through the notice period imposed by his previous employer, prior to commencing with FGR in October 2017. However, we can state that he is an advanced materials chemist who has worked initially for a global chemicals company and more recently for a private graphene and 2D materials company, specialising in technology and IP development, regulatory compliance, market strategy, promotion and business development in the areas of electronics, energy storage, composites, coating and plastics. This appointment will significantly improve FGR's capabilities on a number of process and commercial fronts whilst giving the Company a permanent presence in the UK and European regions. The Company is pleased that a person of this calibre and experience has formed the view that FGR is going to be one of the industry leaders in the graphene world, and that he is committed to this objective.

9.0 Agreements with Universities

It has been a feature of the emerging graphene sector for participants to seek collaborative agreements with universities and research organisations, and announce these to the ASX as evidence of progress. In some cases this is really just a friendly agreement to swap notes and share information, though in many situations this is the information that provides a competitive advantage and is unlikely to be shared without payment. Therefore, while they might sound good, they are of limited commercial benefit. Shareholders in graphene companies need to look for more than collaborative agreements, not just name dropping.

FGR has had dealings with a number of universities over the past two years. There are three main parties with whom commercial agreements have been executed: The University of Adelaide, Flinders University and Swinburne University of Technology.

9.1 The University of Adelaide ("UoA")

UoA was first engaged in May 2015, for the purpose of conducting initial test work to see if the vein graphite was suitable for the electrochemical recovery process. Having shown that it gave exceptionally good results, FGR has continued to work with the UoA to advance the process, before moving to the development self-managed Graphene Cell.

The relationship with UoA continued to grow with the invitation to FGR to become the key industry partner on the Australian Research Council (ARC) Graphene Hub, designed to bring together scientists and industry for the development of applications for commercialisation in industry. The three main areas of graphene research concern the development of fire retardants, conductive coatings and polymer composites. While the wheels of bureaucracy have moved slowly on the path to the formation of this hub, it is nevertheless expected that this initiative will provide FGR with access to intellectual property and patents for application of graphene.

One such licence agreement term sheet was announced in October 2016, and confirmed in December, relating to fire retardant IP. A graphene-based fire retardant has the potential to be used instead of expandable flake graphite that has been used in fire retardant resins. Two patent applications are pending.

The UoA has reported that FGR graphene demonstrates extremely high electrical conductivity with a resistance of less than 100 Ohm, which is between 17 and 50 times better than pristine graphene (1,700-1,900 Ohm) and reduced graphene oxide (5,000 Ohm). Furthermore, spraying of FGR's graphene resulted in homogeneous distribution on sheets whereas standard graphene formed clusters, and therefore had lower conductivity.

9.2 Flinders University – The Vortex Fluidic Device (VFD)

FGR first announced a memorandum of understanding with Flinders University in September 2016, with a view to collaborating on the commercial development of the Vortex Fluidic Device and Turbo Thin Film processing technologies. Of particular appeal to FGR at the time was the potential for the VFD to be used in the secondary processing of exfoliated graphene to achieve a single layer thickness, amongst other applications. There is also the possibility that the VFD could be used to make graphene oxide (GO) from graphite in a much more simple and environmentally friendly way than methods being employed by existing manufacturers of GO.

The VFD and T^2FD were pioneered by Professor Colin Raston, winning the Ig Nobel prize for refolding proteins with the VFD. It has potential for a growing number of processing capabilities, from small molecule synthesis through to processing advanced materials. The technology works by precisely controlling a number of different parameters that affect fluid dynamics and the shear forces experienced by these fluids in continuous process.

In November 2016, FGR announced initial success in producing few layer graphene (FLG) in water using the Turbo Thin Film Device technology, producing graphene nanostructures and scrolls (similar to carbon nanotubes). The process involves a single step, low cost and environmentally friendly method to create high purity products, that offer scalability compatibility and with the Graphene Cell process.

9.3 Swinburn University of Technology

In January 2017, FGR announced a Binding Heads of Agreement with Swinburne regarding the development of a graphene oxide-based supercapacitor that has been named The BEST Battery (Bolt Electricity Storage Technology). Following an extended period of due diligence and documentation, FGR consummated the arrangement in May 2017, giving it the right to earn a 70% interest in the company that held the international rights to a unique technology that utilizes graphene oxide to make what could be the next generation of electricity storage devices.

While technically a supercapacitor, to the man in the street it is a battery that offers the following improvements over lithium ion and other chemical based batteries;

- 10 times better energy density than existing supercapacitors
- ability to charge batteries in a fraction of the time e.g. mobile phone batteries in 30 seconds as opposed to 1-2 hours
- 10,000 charging cycles, as opposed the industry standard of 1,000 cycles
- ultra thin and ultra light weight
- highly flexible and compatible with all devices
- chemical free, so environmentally friendly.

The key to the technology is the ability to create nanopores for storage of electricity using laser technology as opposed to the use of activated carbon, which is used in current supercapacitors.