ASX Announcement

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Strong Progress on BEST™ Battery Development

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HIGHLIGHTS

- Pilot production line for manufacturing the BEST™ Battery has been set up, which is the first and only one of its kind.
- The pilot production line is able to manufacture a commercial prototype of BEST™ Battery that meets the industrial requirements and standards.
- Single layer BEST™ Battery is able to hold LED light for 15-20 minutes on only several seconds of charging time, as shown on the Ragone Plot.
- Eight layer prototype achieved. Scale-up work continuing with steady improvements in performance.
- Continuing optimisation of design aspects and processes, and the use of raw materials to improve efficiencies in both cost and performance.
- Prototype designs for graphene-based flexible smart watchbands that will offer enormous advantageous over existing watches in weight, charging times and battery life.

Advanced materials company, First Graphene Limited ("FGR" or "the Company") (ASX: FGR) is pleased to provide an update on its work with the Swinburne University of Technology (SUT) on the development of the BEST™ Battery. FGR is earning a 70% interest in Graphene Solutions Pty Ltd, the company which has contracted with the Swinburne University of Technology to advance the supercapacitor technology.

Background

While it is generally accepted that lithium-ion batteries are the state-of-the-art energy storage device available for consumer products today, they are not without their issues. In particular, we have seen examples of where they can cause fires in some instances. There is a vast number of companies and research institutions working to provide safer, more reliable and longer life batteries which utilise materials other than lithium-ion. Some of these involve the use of graphene.

First Graphene, through its research and licencing agreements with Swinburne University of Technology, is pursuing a significantly different path to the development of the next generation of energy storage devices. Rather than trying to improve existing chemical battery technology, it is pioneering the field of advanced supercapacitors which have the potential to change the future for energy storage forever, particularly in handheld and consumer products.

Using the advanced qualities of graphene, First Graphene is developing the BEST™ Battery. This energy storage device promises to be chargeable in a fraction of the time and it will be fit for purpose for at least 10 times the life of existing batteries. It will be significantly safer and more environmentally friendly. All these improvements are made possible because the science relies on physics rather than chemical reactions, and on the remarkable properties of graphene materials.

The table below provides an interesting comparison of key operating parameters of the BEST™ Battery alongside existing lithium-ion batteries and existing supercapacitors available in the market. What is particularly noteworthy is the 10x increase in the energy density expected for the BEST™ Battery, when compared with supercapacitors currently on sale in the market place, and the much lower cost per Wh. These features will provide great commercial advantages.

Parameters	Supercapacitor (BEST™ Battery)	AA Rechargeable battery	Existing Commercial Supercapacitor (including Skeleton Supercapacitors)
Storage mechanism	Physical	Chemical	Physical
Charge time	1-10 seconds	1 – 4 hours	1-10 seconds
Cycle life	Minimum 10,000 cycles	300 – 1,000 cycles	Minimum 10,000 cycles
Cell voltage	3.5 V (target for this project)	1.25 – 1.5 V	2.70 V (Average supercapacitor in the market) 2.85 V (Best of Skeleton)
Energy density (Wh/L)	50- 60 (target for this project)	100 to 200	5.9 (Average supercapacitor in the market) 6.8 (Best of Skeleton)
Power density (W/L)	10,000 (target for this project)	35 to 300	9,500 (Average supercapacitor) 42,000 (Best of Skeleton)
Cost per Wh	$0.30 (target for this project)	$0.50 - $1.00 (large system)	$20 (Average supercapacitor) N/A (Skeleton)
Service life	10 to 15 years	1 to 2 years	10 to 15 years
Disposal	No special requirement, environmentally friendly	Land fill, harmful to environment	No special requirement, environmentally friendly

Table 1: Comparison between BEST™ Target development and existing Li Ion AA Batteries and an existing commercial Supercapacitor.

While the exact details of the design and construction of the BEST™ Battery must remain confidential for reasons of commercial security, we can disclose the process of manufacturing the battery involves the use of lasers to create nanopores in graphene-based materials which achieve energy densities more than 10x as great as the pre-existing technology. Practical matters being addressed include the scaling up to the size of the battery from simple laboratory demonstrations of the effectiveness of the science, to devices which will be effective substitutes for batteries used in a wide range of hand held consumer products.

Recent Progress

The first few months of the BEST™ Battery development project entailed the recruitment of additional, highly qualified research scientists and the acquisition of specialised equipment needed to prepare and manufacture the components of the BEST™ Battery. Work has commenced on the improvement of many design aspects in order to optimise the configuration of the battery, with the ultimate objective being to develop a product suitable for mass scale production. At the same time, the methodology of making the battery is being subjected to continuous experimentation to improve the effectiveness and efficiency of the materials and processes used in the device. In addition, the pilot production line for building the BEST™ Battery prototype has been set up, which enables the manufacturing of the BEST™ Battery to meet industrial standards.

Swinburne recently reported that a single layer of the BEST™ Battery prototype that made by the pilot production line was able to sustain an LED globe for a period of 15-20 minutes with only a few seconds of initial charge. This is a very significant outcome, auguring well for the ultimate product which is intended to comprise much more than 100 stacked layers of graphene sheets.

We can track the continuing improvements in the performance of the BEST™ Battery in the Ragone plot below.

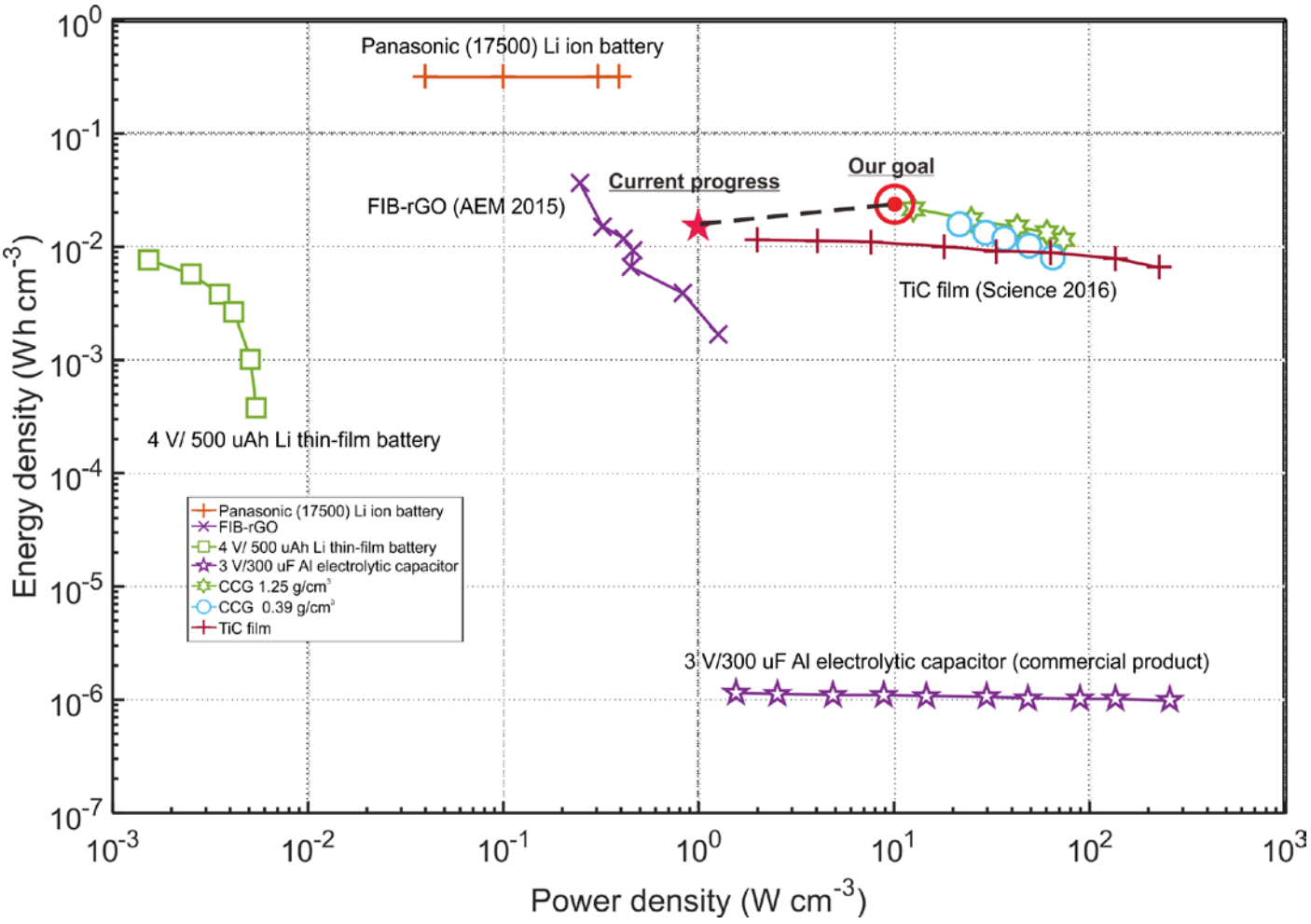

Figure 1: Ragone Plot demonstrating the progress of the BEST™ Battery development toward its goal

Graphene-Based Flexible Smart Watch

The research being undertaken also involves the development of flexible batteries for smart watches which can be incorporated into the watchband itself. These will be light-weight and flexible, they will be able to be recharged in 1-2 minutes, and they will be fit for purpose for many tens of thousands of cycles. Information will be displayed not only on the watch face, but also on the band itself.

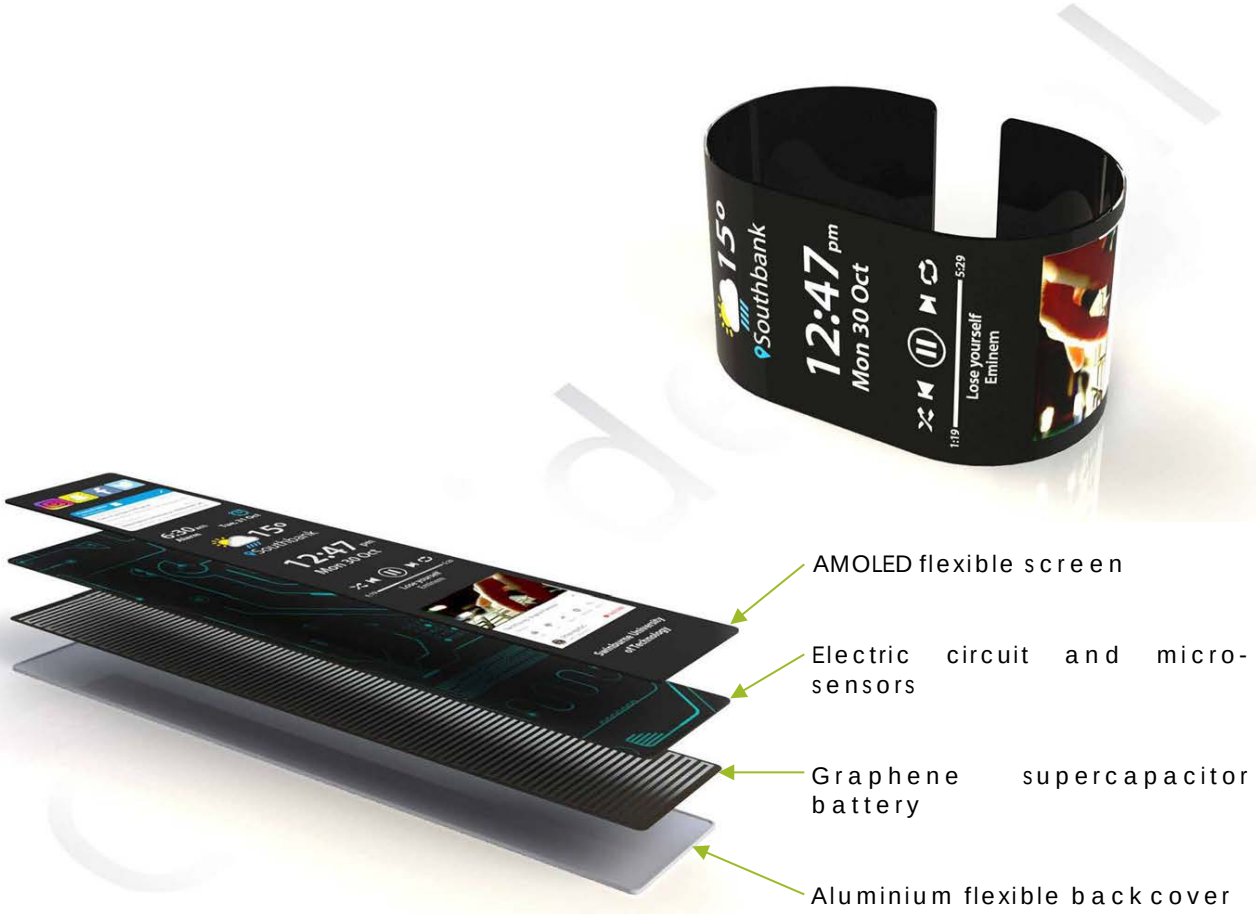

Figure 2: Graphene Watch – Flexible Smart Watch concept

Target Markets

While it is intended that the BEST™ Battery development program will eventually provide suitable substitutes for many devices which currently used flat pack and cylindrical batteries, it will also provide batteries for new, innovative purposes. The thin profile of the Battery, and its flexibility, will make it suitable for use in clothing. It could also be integrated into smart watch bands, as an example, rather than having a solid block configuration. It is already showing excellent ability to convert kinetic energy into stored energy due to the speed at which it can charge i.e. simple movement of shaking can recharge the Battery.

Commenting on these progress, FGR's Managing Director Craig McGuckin said

"The demonstration of full scale commerciality of the BEST™ Battery will take time, but so far the results have been very encouraging. The science has been proved at laboratory scale and now we are advancing many aspects of materials used and design processes leading to the development and optimisation of production methodology. We are very pleased that Swinburne University of Technology has advised us that the pilot production line is a world first. We are confident that the advantages offered by our technology will bring revolutionary changes to how we use batteries in the future, with added safety, efficiencies and flexibilities. The BEST™ Battery will be a serious game changer".

About First Graphene Ltd (ASX: FGR)

First Graphene produces high quality graphene from high grade Sri Lankan vein graphite.

First Graphene seeks to develop graphene production methods and acquire graphene related intellectual property which can provide further revenue related opportunities.

About Graphene

Graphene, the well-publicised and now famous two-dimensional carbon allotrope, is as versatile a material as any discovered on Earth. Its amazing properties as the lightest and strongest material, compared with its ability to conduct heat and electricity better than anything else, means it can be integrated into a huge number of applications. Initially this will mean graphene is used to help improve the performance and efficiency of current materials and substances, but in the future, it will also be developed in conjunction with other two-dimensional (2D) crystals to create some even more amazing compounds to suit an even wider range of applications.

One area of research which is being very highly studied is energy storage. Currently, scientists are working on enhancing the capabilities of lithium ion batteries (by incorporating graphene as an anode) to offer much higher storage capacities with much better longevity and charge rate. Also, graphene is being studied and developed to be used in the manufacture of supercapacitors which can be charged very quickly, yet also be able to store a large amount of electricity.

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