

ASX Announcement (ASX:AXE)

13 February 2020

## Graphene biosensor presentation update

Archer Materials Limited (Archer, the Company) is pleased to provide an update on its shareholder presentations (Events) which took place in Sydney on 10 February 2020, and Melbourne 11 February 2020.

The Events focussed on Archer's graphene-based biosensor technology and progress in developing solutions for the graphene economy, a key area of the Company's strategic activities.

The following Questions and Answers represent supplementary information provided to shareholders who were in attendance at the Events.

<p><b>What does Archer do?</b></p>	<p>Archer provides shareholders with exposure to financial returns from innovative technologies and the materials that underpin them. The Company aims to achieve this by:</p> <ul style="list-style-type: none"> <li>+ Developing our advanced materials business in the key areas of quantum technology, human health, and reliable energy.</li> <li>+ Effectively exploring our mineral exploration projects.</li> <li>+ Identifying opportunities to acquire new value add projects and to realise value through the sale of existing assets.</li> </ul>
<p><b>What is Archer's current strategy to provide shareholder returns?</b></p>	<p>Archer's strategy is to maximise the value of our patents and tenements (assets) through materials development and commercialisation and effective mineral exploration. Our focus is on:</p> <ul style="list-style-type: none"> <li>+ Progressing the quantum computing technology toward commercialisation.</li> <li>+ Prosecuting patents and continuing development of the graphene-based biosensor technology.</li> <li>+ Continued testing of Campoona graphite for use in lithium-ion batteries.</li> <li>+ Identification of partners to co-develop the Campoona Graphite Project.</li> <li>+ Effective exploration of the Company's mineral exploration tenements.</li> <li>+ The sale and acquisition of projects and businesses which add value to the Company.</li> </ul>

<p><b>What do you mean by “materials”?</b></p>	<p>Materials are the tangible, physical basis of all technology. The advanced materials business is focussed on the development of carbon-based technologies such as graphene whereas the focus of the exploration business is the discovery of strategic in-demand minerals such as halloysite-kaolin (alumina-based clays) and nickel.</p>
<p><b>What are your funding requirements for the next year and beyond, and how do you intend to fund the growth strategy given your cash resources?</b></p>	<p>On 31 Dec 2019 Archer had \$2.7 million cash in bank (ASX Announcement 22 Jan 2020) after recently completing a share placement (ASX Announcement 11 Dec 2019) which successfully raised \$1.99 million.</p> <p>Over the last 24 months, we have sold \$3.6m in non-core assets that includes land and tenements (ASX Announcements 8 Feb 2019 and 2 Jul 2018). Of that amount, \$2.0m is due for settlement in cash or shares by July 2020 (ASX announcement 30 Dec 2019).</p>
<p><b>Why is Archer involved in biosensing and biotechnology?</b></p>	<p>Archer’s graphene-based biosensor technology is unique and has the potential to positively disrupt the global medtech industry.</p> <p>There are very few materials in existence that can be used to perform biosensing rapidly and accurately for human health diagnostics. At Archer, we are developing a graphene-based biosensor device that, if successful, will allow for rapid, highly sensitive, portable testing for <i>in-vitro</i> diagnostics.</p>
<p><b>What is biosensing?</b></p>	<p>Biosensing refers to the detection and read-out of molecular-level based bioactivity. Biosensors have a fundamental function in human biology, being used in medical testing and diagnostics. Biosensors can reduce patient wait times by bypassing traditional infrastructure requirements and lengthy testing processes in disease management.</p>

<p><b>What is the size of the biosensor industry?</b></p>	<p>The global biosensor market revenue is expected to grow to US\$27 billion by 2022<sup>1</sup>. There is a global need for healthcare to become cheaper, efficient and more accessible<sup>2</sup>. The key driving factors of growth are aging populations in North America, Asia and Europe. Europe is the largest contributor in the printed sensor market.</p> <p>Biosensors form part of the growing A\$300+ billion revenue global biotechnology industry<sup>3</sup>. With a low industry concentration, large companies use strategic acquisitions to expand their market share and access crucial <i>intellectual property</i> describing products that are commercially viable.</p> <p>Over 75% of biotechnology businesses are located in Europe and North America. Approximately 30% of costs in the industry are related to materials, and the margin in the industry is approximately 20%-30%.</p> <p>Australia has a critical mass of expertise in biotechnology and is at the forefront of the industry.</p>
<p><b>What is graphene?</b></p>	<p>According to the definition of the International Union of Pure and Applied Chemistry, of which Australia adheres to<sup>4</sup>:</p> <p>Graphene is a single carbon layer of the graphite <i>structure</i>, describing its nature by analogy to a polycyclic aromatic hydrocarbon of quasi infinite size.</p> <p>It is incorrect to refer to graphene as a “single layer of graphite”.</p>
<p><b>Why is graphene such an important material?</b></p>	<p>Graphene has a combination of exceptional materials’ properties that could make it useful <i>and</i> valuable. Structural variations at the atom-scale in graphene determine the materials’ properties and function, and therefore its end-use.</p> <p>The graphene surface is ultrasensitive, as molecules only a few atoms from the surface can be accurately detected; this is important in biosensors because this is essentially all you do.</p> <p>Properties of an isolated graphene layer, like strength &amp; conductivity, may not apply in a contiguous bulk-powder.</p>

<sup>1</sup> Biosensors Market by Application, Global Forecast to 2022. Market and Markets, 2017.

<sup>2</sup> 2018 Global Healthcare Outlook. Deloitte, 2018.

<sup>3</sup> Ozelkan, A. IBISWorld Industry Report - Global Biotechnology. IBISWorld. 2017.

<sup>4</sup> <https://goldbook.iupac.org/terms/view/G02683>

<p><b>Do you need graphite to make graphene?</b></p>	<p>Graphite is not the only feedstock to produce graphene. During his PhD at UNSW, Archer CEO, Dr Mohammad Choucair, was the first in the world to directly synthesise graphene in bulk-scale quantities; and not use graphite<sup>5</sup>.</p> <p>Dr Choucair was then awarded the Royal Australian Chemical Institute Cornforth Medal for the most outstanding Chemistry PhD in Australia.</p> <p>Archer can produce graphene from a number of chemical feedstocks, including Campoona graphite and alcohols (e.g. from oil and gas).</p> <p>Archer is currently focusing on the integration and use of Campoona graphite in lithium-ion batteries (ASX Announcement 8 Aug 2019).</p>
<p><b>What is Archer doing with graphene to deliver value to shareholders?</b></p>	<p>Archer is developing the intellectual property (“IP”) associated with a potential solution to printable graphene biosensors capable of complex detection of disease; which could then be used to generate revenue from licencing the IP to companies in the biotech industry.</p>
<p><b>How will Archer commercialise the biosensor technology?</b></p>	<p>The roadmap to commercialising Archer’s graphene-based biosensor includes:</p> <ul style="list-style-type: none"> <li>+ Successfully prosecute patent applications in Australia and around the world in order to provide the commercial freedom to operate in these markets.</li> <li>+ De-risk the technology by progressively building a functioning biosensor.</li> <li>+ Establish commercial partnerships with highly resourced organisations in the biotechnology industry.</li> </ul>
<p><b>What is so special about Archer’s biosensor technology?</b></p>	<p>At the most basic technical and innovative level, Archer has something that no one else has: highly processable graphene materials that allow for selective hierarchal chemistry to the single molecule level with the potential to solve selectivity and detection challenges in biosensing.</p> <p>These materials are the critical components in the biosensor technology being built by Archer. This type of knowledge is very difficult to acquire and is backed by very strong IP that is 100% owned by Archer.</p>

<sup>5</sup> <https://www.nature.com/articles/nnano.2008.365>

<p><b>Who owns the biosensor IP?</b></p>	<p>Archer maintains 100% ownership of the graphene-based biosensor IP.</p>
<p><b>What is the next step in protecting Archer's graphene-biosensor IP and is this protection world-wide?</b></p>	<p>Archer has provisionally patented IP related to the graphene-based biosensor technology (ASX Announcement 19 Feb 2019). Archer intends to lodge a Patent Cooperation Treaty by the deadline of 15 Feb 2020.</p> <p>Filing a Patent Cooperation Treaty ("PCT") application for Archer's IP will allow Archer to decide which countries to have patent protection in and allow for international protection.</p> <p>A PCT application will go through an examination process according to a set of standards accepted by all the 151 countries which are signatories to the treaty.</p>
<p><b>How do you intend to generate revenue from the biosensor technology?</b></p>	<p>The focus is on manufacturing a commercially viable graphene-based biosensor technology and the registration of a full patent application protecting the underlying materials technology IP.</p> <p>Archer intends to commercialise the biosensing technology by seeking to establish commercial partnerships, including licencing agreements, with highly resourced organisations including biotechnology companies.</p> <p>Well-known examples from the biotechnology industry employing and utilising this business model include Bayer, Siemens Healthcare, and Roche Diagnostics.</p>
<p><b>What is the role of the German Biotech company and will Archer continue to work with them?</b></p>	<p>Archer entered into a Material Transfer Agreement ("MTA") with a German Biotech (ASX Announcement 27 Sept 2018) and has since renewed and extended the MTA.</p> <p>The MTA is helping advance Archer's development towards fabricating a proof-of-concept biosensor (ASX Announcements 15 Apr 2019 &amp; 26 Nov 2019).</p>
<p><b>What is Archer's biosensor technology competitive advantage?</b></p>	<p>The uniqueness of Archer's a biosensor technology is the use of digital manufacturing to print critical ultrasensitive graphene materials components that are integrated into one or a number of sensors.</p>

<p><b>How is Archer's biosensor technology different from other diagnostics?</b></p>	<p>Archer's potentially disruptive biosensor technology involves the use of graphene, the thinnest material known, which could act as an ultrasensitive biochemical interface for the complex detection of disease.</p> <p>Other biosensor diagnostic technologies, including those using silicon, have difficulty with biocompatibility (graphene is biocompatible); while optical based materials' biosensing platforms are predominately not portable.</p>
<p><b>Is there any proof that the biosensor technology can work?</b></p>	<p>Archer has rapidly progressed its graphene-based biosensor technology development by recently building a first-phase prototype device (ASX Announcement 26 Nov 2019).</p> <p>To create the biosensor components, graphene ink formulations were printed on a 4 x 8 array of interdigitated gold-plated-nickel electrodes (with micron-scale features). Graphene acted as a sensing interface to detect biochemicals. The 32 sensing electrodes were connected to a computer to monitor, test, and collect data in real-time.</p> <p>The printing process could potentially be translated to automated screen-printing, for low-cost prototype manufacturing.</p>
<p><b>What kind of resources are available to Archer to help compete against the global powerhouses in the biotechnology industry?</b></p>	<p>Archer has several key strengths:</p> <ul style="list-style-type: none"> <li>+ A strong and growing portfolio of IP capturing credible, internationally validated disruptive technology.</li> <li>+ World-class in-house expertise, with pioneers in graphene and nanotechnology leading Archer's projects.</li> <li>+ Access to over \$300 million of state-of-art R&amp;D infrastructure to build and test technology products.</li> <li>+ A diverse advanced materials inventory for rapid device prototyping and integration.</li> </ul>
<p><b>Where can I learn more about biosensing &amp; diagnostics?</b></p>	<p>The Boston Consulting Group have recently written a report titled "<a href="#">Medtech May Be Emerging Markets' Next New Thing</a>" captures a broad view of the state of the industry.</p> <p>More information on Australian regulations related to IVDs can be found here: <a href="https://www.tga.gov.au/medical-devices-ivds">https://www.tga.gov.au/medical-devices-ivds</a></p>

## About Archer

A materials technology company developing materials in quantum computing, biotechnology, and lithium-ion batteries, and exploring for minerals in Australia. The Company has strong intellectual property, broad-scope mineral tenements, world-class in-house expertise, a diverse advanced materials inventory, and access to over \$300 million of R&D infrastructure.

The Board of Archer authorised this announcement to be given to ASX.

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