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Regulatory Release
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SOR Self-Charging Battery Scaling Demonstrates 14V

Western Australia – March 31st 2021 - Strategic Elements Ltd (ASX:SOR) is pleased to announce that it has demonstrated the important potential for the self-charging Battery Ink cells to be 'scaled' down in size. Through scaling more batteries can be assembled in the **same space** leading to **increased density and power output**. The size of the Battery Ink cells were reduced from 1cm^2 in previous work to 25mm^2 achieving a four-times reduction in area. The team fabricated a prototype battery pack with twenty scaled-down connected Battery Ink cells which successfully produced a 14 volt output solely by harvesting moisture from the air.

The scaled-down twenty-cell Battery Ink pack producing 14V has the same surface area of the previous five cell prototype battery pack that produced 4V. The reduced size battery pack prototype was tested under open circuit for a 2 hour period. The highly advanced functional material contains hundreds of thousands of nanoscale sheets of a specialised graphene oxide material and it is a **significant advancement** to demonstrate scaling to this level so early in the development process.

Self-charging Battery Ink Technology

The Battery Ink technology differs significantly from current battery technologies that generally use a small number of alkaline or lithium battery cells to power electronics. The Battery Ink is being designed to be printed into a battery pack of a larger number of connected battery cells.

Therefore the ability to potentially scale Battery Ink cells is a significant advantage for the Battery Ink technology. Through scaling more batteries can be assembled in the same space leading to increased **density of power output**. A similar development pathway has occurred in computer chips where greater performance has been achieved by scaling smaller memory cells.

Printed Electronics

The Battery Ink cells are designed to be printed. Printing has the advantage of (i) enabling the batteries to be manufactured outside of billion dollar manufacturing facilities (such as lithium) (ii) fabricating light, thin and flexible batteries and (iii) simplifying production and reduce costs.

Screen printing is a mature manufacturing technology widely used in many commercial electronic devices. Silver inks are widely used to print electrodes used in sensors and are able to be screen printed down to a small feature size of **1mm** in width providing great promise for the Battery Ink cells to be substantially scaled down.

Market Relevance

The potential ability for the high humidity levels of the human skin to be harvested by Battery ink cells and need for a less bulky and flexible power source make the **electronic skin patch** sector a natural fit for the Battery ink technology.

In addition to increasing power output, scaling down in size also provides strong benefits to **design freedom for applications** that can be powered. Battery Ink geometry is able to be tailored to utilize available space, **unlike traditional bulky batteries which have forced the product to be designed to accommodate them**. This is particularly relevant to the devices that are attached to the human body.

The sector produced USD 10 billion in revenue in 2019 and notwithstanding the bulk and rigidness limitations of current batteries and is forecast to grow to nearly USD 40 billion by 2030[1] technology. **The company is focusing on applications in this sector initially with a view to expand into other areas**.

Likewise environmental and infrastructure sensors that are designed to be built on plastic, glass or wrapped around other curved surfaces require a power source that can conform to curved or flexible surfaces and are also attractive initial user applications. Thus the initial market focus is on wearables and IoT related devices such as cosmetic, pressure, environmental and health (e.g. diabetes or cardiovascular monitoring) as they have lower energy output requirements. Higher performance applications will include development of a capacitor for energy storage/regulation and will be focused on at a later date.

Highly Skilled Team and Collaboration

The Battery Ink is being developed by integrating significant existing ink formulation and printed electronics intellectual property from the Company's Nanocube Memory Ink technology with an advanced graphene oxide material. Development is being conducted under an Australian Research Council part-funded collaboration between the Company, University of New South Wales and the CSIRO (announced 30/7/20).

The group at UNSW have developed deep experience in printed electronic inks, energy harvesting and storage over the past 9 years and are applying that experience in development of the Battery Ink technology. UNSW School of Materials Science and Engineering is ranked #1 in Australia for material science.

The group has attracted over $20M AUD in research funding. UNSW have a number of partnerships and collaborate with leading companies such as Boral, Hitachi Chemical, One Steel and many more. The Material Science and Research group at UNSW has world-class infrastructure and equipment geared towards advanced materials engineering and fabrication.

Next Steps

The technology is being designed to be a hybrid electric generator - battery cell fabricated with a printable ink. Development to date has been focused on **voltage** and the ability to **harvest energy** from humidity in the air. The recent mechanical **flexibility** testing results demonstrate another potential competitive advantage of the technology over current battery technologies that are bulky and rigid. The early stage potential to scale the technology has been demonstrated through these latest results. As has been previously discussed, scaling enables more batteries to be assembled in the same space leading to increased **power output density**.

The next development milestone is to develop a screen printable prototype in Q2 of 2021. Screen printing is a widely used printing technology of choice for printed electronics as it is an existing industrial production method and is capable of producing components at a very small scale.

Electronic Inks are highly advanced functional materials that operate on the nanoscale level. To enable the Battery Ink to be screen printed significant engineering and optimisation must be undertaken. **Once this has been achieved the team will focus on extended stability of overall power output.**

About Strategic Elements

The Australian Federal Government has registered Strategic Elements as a Pooled Development Fund with a mandate to back Australian innovation. The Company operates as a venture builder where it generates high risk-high reward ventures and projects from combining teams of leading scientists or innovators. Investors in SOR potentially pay no tax on capital gains from selling their SOR shares as the Company operates under the Pooled Development program setup to encourage investment into innovation.

Through its 100% owned subsidiaries the Company is:

- Collaborating with giant US Fortune 100 Company Honeywell to build autonomous robotic security vehicles for the correctional justice sector. (announced 16/10/2020)
- Collaborating with the Australian Herbicide Resistance Initiative on applying autonomous technologies to agriculture. (announced 19/10/2020)
- Is working with CSIRO and has licensed world leading CSIRO technology that enables robots to work together in teams. (announced 12/11/2020)
- Developing printable electronic inks for neuromorphic computing and RRAM memory applications under a grant with the University of New South Wales and CSIRO. (announced 30/12/2020)
- Developing a self-charging electrical generator battery technology under a grant with University of New South Wales and CSIRO. (announced 01/12/2020)

More information on the Pooled Development Program is available on the Company's website. The Company is listed on the ASX under the code "SOR". For Company Information: Mr Charles Murphy, Managing Director Phone: +61 8 9278 2788 admin@strategicelements.com.au www.strategicelements.com.au

This announcement was authorised for release by Strategic Elements' Board of Directors.

[1]*https://www.idtechex.com/en/research-report/electronic-skin-patches-2020-2030/743 2*