ASX ANNOUNCEMENT

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Sparc Hydrogen Completes Preliminary Techno-Economic Analysis and Accelerates Pilot Plant

HIGHLIGHTS

- **Preliminary Techno-Economic Analysis completed for Sparc Hydrogen's photocatalytic water splitting technology**
- **Study confirms the commercial potential for the Sparc Green Hydrogen process**
- **Based on the positive outcomes of the study, the Sparc Hydrogen joint venture partners have agreed to accelerate the project schedule and immediately commence scoping work on a pilot plant**

Sparc Technologies Limited (**ASX: SPN**) (**Sparc, Sparc Technologies** or the **Company**) is pleased to report on the completion of a preliminary Techno-Economic Analysis (**TEA**) by Sparc Hydrogen Pty Ltd (**Sparc Hydrogen**).

Sparc Hydrogen, a joint venture between Sparc Technologies, Fortescue Future Industries (**FFI**) and the University of Adelaide, is seeking to commercialise patent-pending photocatalytic water splitting technology with the aim of producing low-cost green hydrogen on a commercial scale (the **Sparc Green Hydrogen** process). The preliminary TEA has been delivered through a collaborative effort from the joint venture partners, led by the University of Adelaide, and supported by independent engineering consultant, ITP Thermal (**ITP**). The completion of this collaborative effort is a significant milestone for Sparc Hydrogen and on the back of the positive outcomes, the joint venture partners have agreed to accelerate scoping activities for a pilot plant ahead of the original project schedule.

Commenting on the milestone, Sparc Technologies Executive Chairman, Stephen Hunt, said:

> *"Today marks a significant milestone for Sparc Technologies and the Sparc Hydrogen JV, with the preliminary TEA confirming the low-cost potential of this green hydrogen technology. The decision to accelerate a pilot plant is evidence of the JV partner's enthusiasm and is an important step on the path to commercialisation."*

Fortescue Future Industries CEO, Mark Hutchinson, added:

> *"Fortescue is building a world-wide tech network to encourage scientists and engineers from across the globe to advance research and development in technologies. Our goal is to develop green hydrogen and renewable energy innovations and technology, with a specific focus on decarbonising hard-to-abate industries that can be commercialised fast. The result of the preliminary TEA is welcome news."*

University of Adelaide's Chief Innovation & Commercialisation Officer, Dr Stephen Rodda, noted:

> *"The preliminary TEA and the resultant decision to accelerate this project is a significant and encouraging outcome for Sparc Hydrogen. It also underscores our collective commitment as JV partners to drive commercialisation of this exciting technology with confidence and aim to achieve commercial scale rapidly."*

Background and Key Objectives

Sparc Hydrogen is seeking to commercialise a process known as photocatalytic water splitting, which employs the sun's radiation and thermal properties to convert water into hydrogen and oxygen. Sparc Hydrogen is utilising technology developed by the University of Adelaide and Flinders University in the form of a solar reactor with the ability to improve the performance of a chosen photocatalyst material.

The preliminary TEA commenced in early 2022 with the key objective of demonstrating the relationship between solar to hydrogen efficiencies (**STH**) assumed for Sparc Hydrogen's solar reactor and the levelised cost of hydrogen (**LCOH**) produced. Since project commencement, the University of Adelaide has been undertaking fundamental research at laboratory scale and has successfully demonstrated advances in solar reactor design and performance under a range of simulated solar conditions. Prior studies in the field of photocatalytic water splitting have used STH assumptions ranging from 5% - 15%, the same as is considered in this TEA. The practical theoretical limit of photocatalytic water splitting is nearly 30%.

Other important objectives of the preliminary TEA were to:

- Assess and compare Sparc Hydrogen's technology against existing technologies, primarily green hydrogen production via electrolysis;
- Identify key infrastructure and utility requirements;
- Identify future opportunities for improving system design and development; and
- Identify key risks in developing and scaling a commercial system.

Study Methodology

The University of Adelaide has led the preliminary TEA with the support of the joint venture partners, Sparc Technologies and FFI. ITP was engaged to conduct a gap analysis and review costing estimates.

The analysis is based on a number of assumptions, including the choice of a reference project to model energy production and costings. The scale of the reference project was chosen in order to compare to a ~250MW solar PV electrolysis project. Future work will consider the impacts of scale and location on optimal use cases and cost outcomes for the technology.

Initial design and costing estimates for the requisite infrastructure were provided by the University of Adelaide and subsequently reviewed and updated by ITP. ITP performed a limited market sounding to inform and update its internal cost model to estimate costs associated with the solar field which represents a large portion of the capital costs. ITP has also opined on learning rate estimates for the solar field and balance of plant.

Preliminary TEA Outcomes

The results of the preliminary TEA have been generated for internal evaluation by Sparc Hydrogen. Based on the attractive LCOH under various scenarios along with the other potential benefits of the technology, the joint venture parties have agreed to accelerate the project schedule and immediately commence scoping work on a pilot plant. Ongoing R&D and further modelling is being conducted to refine and narrow the potential range of outcomes along with the other key assumptions in the preliminary TEA.

The preliminary TEA has considered the infrastructure, land and utility requirements for the Sparc Green Hydrogen process. Water and land use are increasingly important for establishing a social licence to operate for large infrastructure and energy projects, including renewables where delays in permitting and grid connections have become commonplace in Australia. The pilot plant will seek to validate the potential of the technology to yield material reductions with respect to electricity, water and land use against existing hydrogen production processes.

Electrolysis and other hydrogen production processes have significant infrastructure requirements, are typically considered at very large scale to reduce costs and can be less suited to remote locations without access to the electricity or gas grid (such as remote mine sites). Sparc Hydrogen is aiming to develop its technology to:

- eliminate the need for solar PV and wind farms for green hydrogen production and therefore de-couple green hydrogen costs from renewable electricity;
- demonstrate inherent scalability due to not requiring an electrolyser;
- efficiently use water and land resources;
- flexibly accommodate new and better photocatalysts as technology continues to advance in this field; and
- suit locations with good solar resource, but not necessarily with established transmission or grid infrastructure.

Sparc Hydrogen's photocatalytic water splitting technology is in the R&D phase and there are a number of R&D and engineering challenges that need to be overcome prior to potential commercialisation. A summary of the key risks that may delay or prevent commercialisation and/or meeting the assumptions contained in the preliminary TEA include:

- advances in the development of photocatalysts for water splitting materially slows or there are issues in the mass production of a chosen photocatalyst;
- performance of the photocatalyst in Sparc Hydrogen's solar reactor does not meet expectations;
- performance of the solar reactor does not meet expectations in either the laboratory or in the field;
- Sparc Hydrogen is unable to secure access to photocatalyst material through commercial arrangements;
- engineering challenges inhibit the performance of the system;
- ongoing maturation of the requisite solar field technology does not occur according to expectations and learning rate improvements are not achieved;
- health and safety issues;
- IP issues or infringements inhibit Sparc Hydrogen's ability to develop or commercialise the technology; and
- loss of key personnel.

Technology Development

The Sparc Green Hydrogen process utilises thermo-photocatalysis, which employs the suns radiation and heat to convert water into hydrogen and oxygen. Adopting this process to potentially produce green hydrogen at scale is an alternative to electrolysis which requires large amounts of renewable electricity from wind farms and/or photovoltaic solar panels and expensive electrolysers.

The current technical readiness level (**TRL**) is assessed by the joint venture participants at level 4[1]. Prototypes have been developed and tested in a laboratory environment and substantial datasets have been produced under simulated solar conditions.

[1] Having reference to the *Technology Readiness Levels for Renewable Energy Sectors* published by the Australian Renewable Energy Agency, a department of the Australian Government (2014).

The target by the end of the joint venture work program announced on 2 February 2022 is to progress to TRL-6 with the installation of a pilot plant, work on which is now being accelerated as a result of the positive preliminary TEA outcomes.

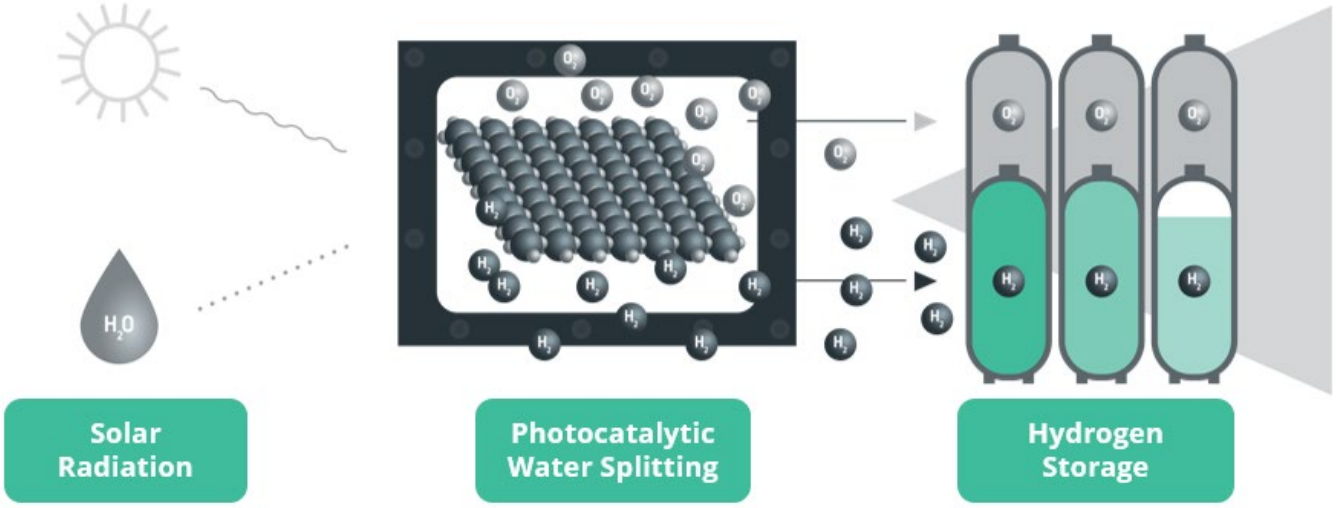

Figure 1: Sparc Green Hydrogen process schematic

Work to Underpin the Study

Sparc Hydrogen's solar reactor concept and design has been developed over ~5 years by researchers at the University of Adelaide and Flinders University which is the subject of a pending patent application. The University of Adelaide has successfully demonstrated in various laboratory prototypes that its solar reactor can accelerate the water splitting reaction under a range of simulated solar conditions. The ability to amplify the efficiency of a chosen photocatalyst material is a key benefit of Sparc Hydrogen's solar reactor. Since the Sparc Hydrogen joint venture was formed in early 2022 various designs of solar reactor have been developed and tested.

Funding

Sparc Hydrogen's funding structure was announced on 2 February 2022. The Company confirms that the initial Stage 1 investment in support of advancing the project for the first 2.5 years has been paid by the Company, and that funding with respect to Stage 2 currently remains as announced on 2 February 2022. A working group has been established by the joint venture partners to assess the budget and program in the context of an accelerated pilot plant which was previously considered in Stage 2.

Next Steps

Sparc Hydrogen will continue to update and refine the preliminary TEA over the course of the next 12 months and the Company will update the market in line with its continuous disclosure obligations.

-ENDS-

Authorised for release by the board of Sparc Technologies.

For more information:

Stephen Hunt
Executive Chairman
+61 402 956 205
Stephen.hunt@sparctechnologies.com.au

Mark Flynn
Investor Relations
+61 416 068 733
mark.flynn@sparctechnologies.com.au

About Sparc Technologies

Sparc Technologies Limited (ASX: SPN) is an Australian company pioneering new technologies to disrupt and transform industry while seeking to deliver a more sustainable world. Sparc Technologies has established offices in Europe and North America.

Graphene, a major focus for Sparc Technologies, is a 2-dimensional material made of carbon atoms arranged in a hexagonal lattice which creates unique and powerful properties that can be imparted on products to improve performance. Sparc Technologies is commercialising graphene in a number of applications including Graphene Based Additives for the Marine & Protective Coatings market along with applications in the renewable energy and construction materials sectors.

Sparc Technologies, via its majority interest in Sparc Hydrogen, is also focussed on developing photocatalytic green hydrogen technology that does not require solar and/or wind farms, nor electrolysers as with conventional green hydrogen processes.

Forward Looking Statements

Statements relating to the estimated or expected future costs and financial condition of Sparc Hydrogen's planned development of the patented photocatalytic water splitting technology and the expected results of such work are forward-looking statements. Forward-looking statements are statements that are not historical facts and are generally, but not always, identified by words such as the following: expects, plans, anticipates, forecasts, believes, intends, estimates, projects, assumes, potential and similar expressions. Forward-looking statements also include reference to events or conditions that will, would, may, could or should occur.

These forward-looking statements are necessarily based upon a number of estimates and assumptions that, while considered reasonable at the time they are made, are inherently subject to a variety of risks and uncertainties which could cause actual events or results to differ materially from those reflected in the forward-looking statements, including, without limitation the matters set out in this announcement.