SunHydrogen Well-Positioned to Scale Technology From Lab-Scale to a 1m2 Green Hydrogen Panel

written by Raj Shah | November 7, 2023

November 7, 2023 (Source) – SunHydrogen, Inc. (OTC: HYSR), the developer of a breakthrough technology to produce renewable hydrogen using sunlight and water, today provided an update to its shareholders from its Chief Scientific Officer, Dr. Syed Mubeen, as follows.

At SunHydrogen, our mission is to replace fossil fuels with clean, renewable hydrogen. In this update, I am thrilled to share with you our recent notable achievements and roadmap for the future as we work to commercialize our nanoparticle-based green hydrogen technology.

Just like a solar panel is comprised of multiple cells that generate electricity, our hydrogen panel encases multiple hydrogen generators immersed in water. Specifically, the SunHydrogen Panel is made up of the following major components:

1) Hydrogen generator: The hydrogen generator forms the core of our technology and is composed of:

- Substrate with protective layers and ion-transport channels: The substrate serves as the foundation upon which billions of nanoparticles are electroplated and protected from corrosion. The ion transport channels in the substrates are designed to prevent hydrogen and oxygen from mixing, ensuring safe and high-purity production of

hydrogen and oxygen.

- Nanoparticle-based semiconducting photovoltaic layers: The semiconducting layers harvest energy from sunlight to generate necessary photovoltages and photocurrents.
- Oxidation/reduction catalysts: The catalysts use this voltage and current to split water molecules into hydrogen and oxygen.

2) Device housing: The device housing encases one or multiple arrays of hydrogen generators with necessary optical windows and piping for continuous collection of hydrogen and oxygen.

Below is a summary of our recent progress in each of these areas.

Substrate

We have successfully validated the manufacturability of our substrates at both the 25cm^2 and 100 cm^2 scale, working closely with our industrial partners including Geomatec, a leading manufacturer specializing in thin-film technology; InRedox, an expert in electrochemically-assisted, self-organized nanostructured materials; and our dedicated team at the University of Iowa. Building on this accomplishment, our ongoing work is focused on scaling up the production process to meet the substrate requirements for a 1m^2 SunHydrogen Panel. The 1m^2 scale is of the utmost importance as it represents the commercially-relevant dimension at which we intend to introduce and showcase our technology in multiple pilot projects.

Semiconducting Photovoltaic Layers

Located in the core of our hydrogen generator are two semiconductors configured in a dual-junction setup, designed to harness photovoltage and photocurrents crucial for the

autonomous splitting of water molecules.

When integrated in this dual-junction setup, our semiconductor units consistently attain photovoltages of 1.8 volts at the 100 cm^2 scale, surpassing the required photovoltage for water-splitting by 1.5 times. This accomplishment ensures optimal performance and efficiency, even in the face of potential voltage losses. Additionally, we have also demonstrated single-junction photocurrent densities of 18 milliamps per square centimeter.

Further, our Iowa team, working in conjunction with the National Renewable Energy Lab, has spearheaded the development of innovative design alternatives for producing a dual-junction hydrogen generator device that could potentially operate at a 10% solar-to-hydrogen efficiency. This design can seamlessly integrate into existing photovoltaic production platforms, allowing for reduced module cost and fewer barriers to scale-up.

While our past communications have highlighted our ambition to reach even higher efficiencies, we believe it is important to emphasize that achieving a 10% solar-to-hydrogen efficiency using commercially-proven, inexpensive semiconductor materials sets us apart from existing solutions and marks a significant milestone.

To put our progress in perspective, a hydrogen panel installation operating at 10% solar-to-hydrogen efficiency on one football field would have the potential to generate approximately 40 metric tons of hydrogen annually.[1]

Our recent accomplishments position us to scale our technology to a $1m^2$ hydrogen panel with COTEC Corp., our industrial partner in Korea.

We are parallelly working to increase our solar-to-hydrogen efficiency with the Project NanoPEC team in Germany and with the University of Iowa.

Catalysts and Membranes

Led by Dr. Nirala Singh, the University of Michigan team is playing a crucial role in our efforts to optimize and test potential catalysts for hydrogen and oxygen evolution. The catalysts synthesized by the team operate efficiently for hydrogen production, and the team is working to improve their stability.

Our collaboration has also yielded exciting progress in the exploration of potential membraneless operation of our technology. This innovation has the potential to generate substantial savings of up to 8-10% in panel costs.

Device Housing

We are currently consulting with world-leading experts to develop innovative reactor designs and system layouts that minimize the overall levelized cost of hydrogen. We anticipate finalizing these designs in early 2024, paving the way for the deployment of pilot scale projects that showcase the world's first wireless green hydrogen production using cost-effective semiconductors.

As we forge ahead, the SunHydrogen team remains committed to finding the most efficient path to scale our technology and accelerate our mission of bringing renewable green hydrogen to the world.

About SunHydrogen, Inc.

SunHydrogen is developing breakthrough technologies to make, store and use green hydrogen in a market that Goldman Sachs

estimates to be worth $12 trillion by 2050. Our patented SunHydrogen Panel technology, currently in development, uses sunlight and any source of water to produce low-cost green hydrogen. Similar to solar panels that produce electricity, our SunHydrogen Panels will produce green hydrogen. Our vision is to become a major technology supplier in the new hydrogen economy. By developing, acquiring and partnering with other critical technologies, we intend to enable a future of emission-free vehicles, ships, data centers, aircrafts and more. To learn more about SunHydrogen, please visit our website at www.SunHydrogen.com.

Safe Harbor Statement

Matters discussed in this press release may contain forward-looking statements. When used in this press release, the words “anticipate,” “believe,” “estimate,” “may,” “intend,” “expect” and similar expressions identify such forward-looking statements. Actual results, performance or achievements could differ materially from those contemplated, expressed or implied by the forward-looking statements contained herein. Forward-looking statements are based largely on the expectations of the Company and are subject to a number of risks and uncertainties and other factors, known and unknown, including the risk factors described from time to time in the Company’s reports filed with the Securities and Exchange Commission. Forward-looking statements contained herein are applicable only as of the date on which they are made, and the Company does not assume any obligation to update any forward-looking statements, except as may be required under applicable law.

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1: Based on a constant average solar irradiance of 277.5 W/m2

and hydrogen’s lower heating value of 33.33 kWh/kg.