

HYDROGEN

SOLUTIONS

Powering the Future for **Sustainable Energy**



Welcome

This is the third update to all Direct Energy investors. With these updates we will keep you informed of our activities and achievements in bringing truly inspiring innovation to the hydrogen sector.

Your interest and commitment are what fuels it all, contributing to next generation products designed to deliver real change to the energy sector globally.

Direct Energy

As reported in the previous update, we have completed a JV agreement to move the IP and future work to the UK. Direct Energy Pty has developed, over the last decade, ground-breaking IP in the fuel cell/electrolyser markets.

This agreement will allow Hydrogen Solutions Ltd and/or Direct Energy to complete the R&D, life testing and commercialization with UK company and Government sponsored universities.

We are launching the UK R&D program to develop the HOT BOX product under the sub-brand name Electrocel. Work will begin in 2024.

The roots of the Australian team can be traced back to the inception of the Ceramic Fuel Cell Company, which laid the foundation for the intellectual property (IP) now integral to this project. Over the past decade, they fostered strong relationships and conducted extensive research in Solid Oxide Fuel Cell (SOFC) and Solid Oxide Electrolysis Cell (SOEC) technologies, collaborating closely with both the University of Queensland and the Australian Government. This enduring commitment to research and development has solidified their expertise and positioned them as leaders in the field.

Their IP has been verified by Independent Industry Expert Professor Nigel Brandon (Founder of Ceres Power and Dean of the Faculty of Engineering Imperial College London) as "Real and Credible" within a select Global Group where there are few available investor entry points.

Based on strong recommendations from Professor Brandon, our team has chosen to focus technology development on a SOEC in the next 2 - 3 years (for the purpose of producing green hydrogen), to be followed by SOFC development later.

Green hydrogen, or "e-Hydrogen," is produced through a process called electrolysis, where water (H₂O) is split into hydrogen (H₂) and oxygen (O₂) using electricity. This electricity is sourced from renewable energy, such as solar, wind, or hydroelectric power, making the entire process environmentally friendly.

In electrolysis, electricity passes through water, causing the water molecules to break apart into hydrogen and oxygen gases. The hydrogen can then be captured and stored for various applications, such as fuel for transportation, energy storage, or industrial processes.

Projections for the market size of green hydrogen in 2050 vary depending on factors such as technological advancements, policy support, and the pace of renewable energy adoption. However, estimates from organizations like Goldman Sachs suggest a significant growth, with a projected addressable market of \$10 trillion globally for the Utilities industry alone by 2050. This indicates a substantial opportunity for green hydrogen to play a crucial role in decarbonizing various sectors of the economy and achieving climate goals. Therefore, Hydrogen Solutions development plan is critical and your support vital and timely.

Gearing Up

Electrolyser Technology Comparison:

There are three classes of electrolyser technology (note electricity equals ~70% of green Hydrogen cost so greater efficiency results in less electricity usage per kg of hydrogen produced):

Alkaline Electrolysers – the most common and suited for baseload application. Mature technology with low material costs and high durability. Low efficiency (55%), low energy density and need for a large footprint.

PEM Electrolysers – suited for variable renewables and vehicle refueling. Commercially available with higher power density. Can load-balance and supply high pressure hydrogen. Expensive materials and low energy efficiency (65%).

Solid Oxide Electrolysers – most suited for industrial scale hydrogen production. Operate at higher temperatures using waste industrial heat. Increases efficiency to >90% resulting in lowest operating cost.

Our proprietary anode-supported design ensures the highest power density, producing the highest efficiency and lowest operating cost. Our innovative seal and manifold design is collectively the 'missing link' in solid oxide electrolysis ensuring high integrity and durability. Our design uses specialist materials and coatings, combined with off-the-shelf components in a unique manner, reducing scale-up risk and cost.

To commercialize our Solid Oxide Electrolyser design, we have developed a product development plan that includes the testing, IP development, engineers, technicians, channel partner experts and other support personal required. The hiring plan will build up slowly over the next two years and parallel the product development plan. When completed, we will have channel partners onboard and start licensing the hot box technology to these partners. From there product and aftermarket sales will begin.

Enterprise Investment Scheme and fund raising

Our team has filed all the paperwork with HMRC for certification of the Enterprise Investment Scheme (EIS) and answering all HMRC questions. The EIS offers significant tax reliefs to encourage individuals to invest money in qualifying shares issued by qualifying unquoted companies. We anticipate EIS approval shortly.

We have engaged with brokers, high net worth individuals and family offices experienced in Hydrogen project funding and anticipate first significant raise shortly after receiving HMRC approval.

Direct Energy Shareholders and Loan Note Holders

A comprehensive plan has been outlined to address the transition of Direct Energy shareholders into Hydrogen Solutions, offering a transparent and equitable process for all stakeholders involved. Shareholders of Direct Energy will be allocated shares in Hydrogen Solutions, ensuring their seamless integration into the new entity. This is designed to drive sustainable growth and value creation for Direct Energy Shareholders.

Additionally, Direct Energy loan note holders will receive detailed notification regarding the timing for the payment of interest. Furthermore, they will be presented with the option to convert their notes into shares in Hydrogen Solutions or receive payment of the principal amount. Both interest and principal notification will happen upon the receipt of the first funds. This approach provides flexibility for note holders to align their investment preferences with the strategic direction of the company.

It is crucial to note that these processes will be executed promptly following the attainment of EIS certification. EIS certification serves as a pivotal milestone, signifying the completion of rigorous HMRC assessments and regulatory approvals necessary for project implementation.

By orchestrating this transition shortly after EIS certification, the company demonstrates its commitment to efficiency and timely execution, ensuring a smooth transition for all stakeholders involved. This strategic initiative underscores the company's dedication to maximizing shareholder value.

