



Wednesday, 30 November 2022

## **Submission to the Joint Committee on Trade and Investment Growth**

### *Inquiry into Australia's transition to a green energy superpower*

#### **About Star Scientific Limited**

Scientific Limited is a private research and development company located on the Central Coast, north of Sydney, Australia and south of the industrial port of Newcastle. It was founded by Andrew Horvath in 1997.

Star Scientific discovered and developed a breakthrough technology for converting hydrogen into heat without combustion – the Hydrogen Energy Release Optimiser, or HERO®.

*Please note from here that when this submission refers to “hydrogen” we mean “green” or “renewable” hydrogen from renewable energy sources unless otherwise stated.*

HERO® is unique. It has been patented globally and has no competitors.

The catalyst is usually applied to a metal substrate in the form of a coating. The heat is then transferred, primarily via conduction, through the substrate. The development of HERO® for commercial application is leading to significant advances in our understanding of substrate materials.

When introduced to hydrogen and oxygen in a closed environment the catalyst acts quickly to generate industrial-scale heat. In test runs, Star Scientific has generated over 700 degrees Celsius in just over three minutes. The only other output is pure water, which can be reused in the process of hydrogen generation. There are no greenhouse gasses produced.

A demonstration of HERO® can be found at <https://starscientific.com.au/applications/>.

Testing has proven HERO® can be run continuously without any detriment to the catalyst itself. Once the feed gases are removed it quickly reverts to its inert state with zero combustion. The catalyst consists of relatively common materials, is responsibly sourced and is not toxic to the environment.

The company's HERO® technology was recognised at the Sustainable Energy Council's inaugural World Hydrogen Awards, winning the Industrial Application category in March

2021 and earlier this year was announced the winner of the New Economy category of the 24th Annual South by Southwest (SXSW) Innovation Award.

The retrofitting of existing fossil fuel-powered energy infrastructure is a key pathway for Star Scientific, with Cambridge Econometrics estimating the value of potentially stranded assets at up to US\$4 Trillion.

However, it is with process heat for industry, largely as a replacement for the combustion of natural gas, that Star Scientific believes is the early pathway for the use and acceptance of hydrogen. A range of companies globally are urgently seeking a replacement for natural gas that can generate industrial levels of process heat without creating greenhouse gas emissions. Accordingly, Star Scientific is conducting its first pilot project for Mars Australia at its Berkeley Vale plant (two blocks from our facility).

The global food industry, in all its forms and across its whole supply chain, is particularly interested in HERO®.

## **Terms of Reference**

### **Australia as a hydrogen exporter**

Orthodox literature, and many government policies, foreshadow Australia as a hydrogen export “superpower”, following the standard Australian path of exporting a cheap commodity for others to value-add. While there is undoubtedly some future in the export of raw hydrogen, either as a gas, liquid or in the form of ammonia, we believe that there should be some caution in overstating this.

Firstly, the International Renewable Energy Agency (IRENA) report from earlier this year “The Geopolitics of the Energy Transformation: The Hydrogen Factor”<sup>1</sup>, found that the global trade in hydrogen is unlikely to be “cartelised” by the same long, thin, capital-intensive supply chains as fossil-fuels. This is because the renewable energy resources required to make renewable hydrogen are widespread and diverse and the production of hydrogen is a “conversion” process. Producing fossil fuels, on the other hand, is an “extractive” process and of a relatively rare resource. In other words, you can make hydrogen in a lot more places than you can find fossil fuels, and it will be cheaper to acquire.

Star Scientific believes the export “play” for hydrogen is as embedded as process heat or energy in our manufactured and agricultural exports. Our services exports can be supported too, in the form of providing carbon-free energy to digital service providers.

HERO®’s capacity to produce carbon-free industrial-scale process heat has drawn the attention of many manufacturers, particularly in the food industry. By “food industry” we

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<sup>1</sup> <https://www.irena.org/publications/2022/Jan/Geopolitics-of-the-Energy-Transformation-Hydrogen>

mean in its broadest sense, from growing to processing to packaging to waste treatment. The key motivator here is companies fearing a boycott of heavily carbon-intensive products, either by individual consumers or retailers or the imposition of cross-border carbon levies on imports such as the “Carbon Border Adjustment Mechanism” mooted by the European Union. Star Scientific is in discussions with a wide range of companies sourcing carbon-free industrial heat and is conducting our first pilot project for Mars Foods Australia at the Berkeley Vale Masterfoods plant.

### **Australia as a hydrogen technology supplier**

As the IRENA report points out, participation in the hydrogen technology supply chain can earn lucrative returns for suppliers:

“The hydrogen value chain is extensive, and the bulk of the investment will be needed for renewable power. Along this value chain, estimates point to a USD 50-\$60 billion market potential for electrolyzers and a USD 21-25 billion market for fuel cells by the middle of the century.”

We regard this as a significant underestimation of the market for hydrogen technology. The market for fuel cells is largely aimed at mobility while HERO® is positioned to provide industrial-scale heat and fill a large gap in the technology chain.

Star Scientific is determined that its first mass-manufacture facility will be in Australia and that we will service our entry into global markets from here. Additionally, we are collaborating with other global OEMs to build other innovative elements of the global hydrogen supply chain around the HERO® system, and this collaboration will involve the transfer and acquisition of significant investment, skills, and scientific knowledge to Australia. These developments will be in the fields of science, technology, and advanced manufacturing.

### **The role of Australian Government Agencies**

Star Scientific has already enjoyed strong in-market support from the Department of Foreign Affairs and Trade (DFAT), Austrade and State Government trade and investment officers.

Indeed, DFAT and Austrade were instrumental in us signing a Memorandum of Understanding with the Republic of the Philippines in 2021, to help them as they begin to transition their economy to one based on renewable energy and in particular renewable hydrogen.

Beyond Star Scientific’s immediate interests, we have observed, on many occasions, that DFAT and Austrade play an exceptional role in advancing our interests in the rapidly developing global trading system around renewable energy, specifically hydrogen.

In the field of hydrogen specifically, DFAT, Austrade (and the States) have been vigorous and active in this critical and developing field. We observed the high regard our agencies are

held in by other major participants in the hydrogen economy, including Germany, Japan, Korea, and the United States. We participated in the Australian delegation to the Global Hydrogen Summit in Rotterdam in May this year and observed how the Australian stand soon became the focal point of the exhibition floor. In our view, it is critical that in the fast-developing world of hydrogen, Australia continues a vigorous presence via both its industry and government agencies.

Apart from the direct economic benefit, we believe that it is in our direct geo-political interests for Australia to be a robust participant in the developing hydrogen economy, both in our region and across the globe. This is because hydrogen has the capacity, as outlined in the IRENA report, to deliver billions of people from energy poverty and to set them on the path to environmentally sustainable economic growth, and therefore as trading partners for our country with associated diplomatic benefits.

### **Conclusion**

Star Scientific looks forward to participating in global hydrogen technology supply chains via our unique HERO® technology, which can provide industrial-scale process heat and energy for industry. We view Australian Government agencies, specifically DFAT and Austrade as critical partners in our endeavours and we would encourage them to continue the vigorous representation of our country in the developing global hydrogen industry.

We would be happy to provide further details.

Ends.