EarlyBirds Insights Series

Kickstarting Innovation And Collaboration in **Hydrogen Projects**

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www.earlybirds.io

INTRODUCTION

“ indicators of a potential structural change in energy markets. ”

“ Facilitating collaboration amongst innovators and industry (early adopters) ”

Energy Transition is accelerating at an unprecedented pace. Net zero targets and strategic investments in renewables by some of the world’s biggest energy companies combined with more challenging access to traditional hydrocarbons are indicators of a potential structural change in energy markets. Hydrogen offers an environmental - ly-friendly option for several applications that can easily transition away from fossil fuels at an attractive price point while improving Corporate Social Responsibility (CSR) for those organisations and their stakeholders.

The objective of this paper is to highlight an alternative pathway for fast-track innovation thereby accelerating the move towards net zero. Facilitating collaboration amongst innovators and industry (early adopters) may allow organi - sations to forge a leadership position with this emerging energy source via the EarlyBirds Innovation Ecosystem (EIE) **https://earlybirds.io.**

BACKGROUND AND CHALLENGES

The EarlyBirds Innovation Ecosystem (EIE), established in 2019 is designed to enable innovation at an enterprise level by creating connections between early adopters and innovators, supported by independent subject matter experts. This article examines the application of the EIE in the Hydrogen technology space.
At the heart of the EIE is the EarlyBirds Marketplace which currently hosts over a million innovators, including research organisations, private and public companies as well as start-ups and scale-ups. An opportunity exists for what are known as Early Adopters of technology working in the Energy Transition space to exploit this database and engage with Innovators in a highly cost-effective manner.

“ a key target for Hydrogen production being set at $2/kg. ”

The Hydrogen sector in Australia is emerging rapidly with some 54 projects identified by the CSIRO HyResource website[1] as at 31st October 2020 (www.research.csiro.au/hyresource/). The sector is strongly support- ed by the Australian Federal Government as announced in Australia’s National Hydrogen Strategy[2] (2019) and the Technology Investment Roadmap (2020)[3] - with a key target for Hydrogen production being set at $2/kg.

The emerging challenges associated with achieving this production cost target in the global Hydrogen supply chain fall generally into three categories:

- Production (Drives the production cost)
- Mobile Storage and Transport (Driven by market demand and indirectly drives production cost)
- End Use Cases (Drives the market volume and indirectly drives production cost)

Production. The identified challenges and opportunities that require collaboration include:

- Improved efficiency of electrolysers
- Reduced power costs
- Green vs Blue power sources
- Availability of clean water
- Technology for use of sea water

Transport. The identified challenges and opportunities that require collaboration include:

- Infrastructure for storage of Hydrogen
- Format for storage (Gas / Liquid / Ammonia)
- Perception of safety in storage of Hydrogen
- Mode of transport of Hydrogen (Trucks / Pipelines / Ships)
- Format of transport of Hydrogen (Gas / Liquid / Ammonia)
- Perception of safety in transport of Hydrogen
- Cost effectiveness and efficiency loss during storage and transport

End Use Cases. The identified challenges and opportunities that require collaboration include:

- Cost and efficiency improvements to enable transition of motor vehicles, ships and trains from Hydrocarbon based fuels to Hydrogen

  Availability of efficient Hydrogen engines for cars and trucks
  Hydrogen powered combustion engines vs fuel cells
  Refuelling Infrastructure
- Innovative Use of Hydrogen to fuel drones to aircrafts

- Cost and efficiency improvements to enable transition to Hydrogen as an energy source in manufacturing and the generation of grid power
- Compliance with Australian Standards and Regulations

"How do companies innovate?"

These challenges represent a broad range of opportunities for companies and individuals to innovate. How do companies innovate? David Thodey[4] (AO FAICD, Chair CSIRO, Xero) has said "Innovation is both an attitude and a process. Innovation is a skill set of openness, of questioning, of willingness to push boundaries and not accept the status quo. You need creativity, but you also need to have metrics and systems working. Innovation, to me, is this constant pursuit of improvement."

We see these attributes frequently in the emerging Hydrogen sector making it fertile ground for successful innovation. The EIE also has all the main ingredients for achieving successful innovation in an accelerated project development environment.

EARLYBIRDS INNOVATION ECOSYSTEM

"actionable innovation is achievable via three key components"

The EarlyBirds Marketplace is the central component of the EarlyBirds broader Ecosystem. The EarlyBirds philosophy is that actionable innovation is achievable via three key components:

- Clear articulation of the challenges put forward by Early Adopters (supported by Subject Matter Expert (SME) Consultants);
- A large pool (in this case over 1.1 Million) of innovators which are available in the EIE; and
- Subject Matter Experts available to incubate with Early Adopters and Innovators using the EIE.

01. Growing Community of Early Adopters

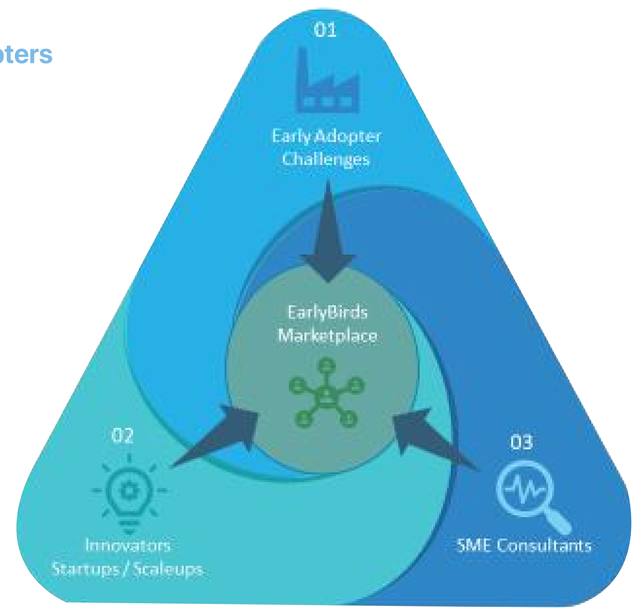
- Next Discruption
- Source of Actionable Innovation
- Proccure quick and at low cost but Comples
- Procurement
- Acces to innovation is sioled

02. 1M+ innovators

- Disruptive Tech
- Commercializtion
- Complex Procurement
- Limited Resources

02. 1M+ innovators

- Unique Experince
- Resolve Challenges
- Seize Opportunities
- Confidentiality



Early Birds Platform

- Open Ecosystem
- Macthes on:
  - Industry
  - Function
  - Outcomes
- Facilitates Transaction

ANALYSIS AND RESULTS

An initial search of the EIE using keyword "hydrogen" provided almost 200 organisations working with hydrogen. After filtering out of non-Energy related organisations the search identified 91 companies as having technology highly relevant to the Hydrogen (Energy) sector. The geographical distribution of these 91 companies is shown in Figure 1. The data showed a strong presence of Hydrogen technology companies in Europe (almost half) which we believe is representative of the broader market.

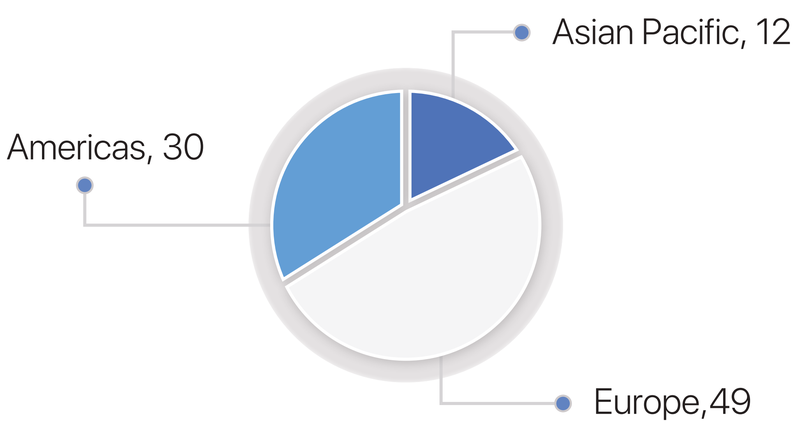


Figure 1 – Geographical Distribution of Hydrogen Technology Companies (31 October 2020)

“Most organisations in the EIE are indeed technology providers”

The dataset was then broken into two broad categories:

- Technology providers, which included organisations that are geared towards providing one or more discreet pieces of equipment. These organisations are often established and currently already delivering solutions where some others are seeking funding to further develop their concepts; and
- Solution providers, which included organisations that provide consulting services, policy advice and development as well as in some cases broad infrastructure development for Hydrogen projects without a specific technology in focus.

Most organisations in the EIE are indeed technology providers, which was to be expected from the nature of the platform. The breakdown by category is shown graphically in Figure 2.

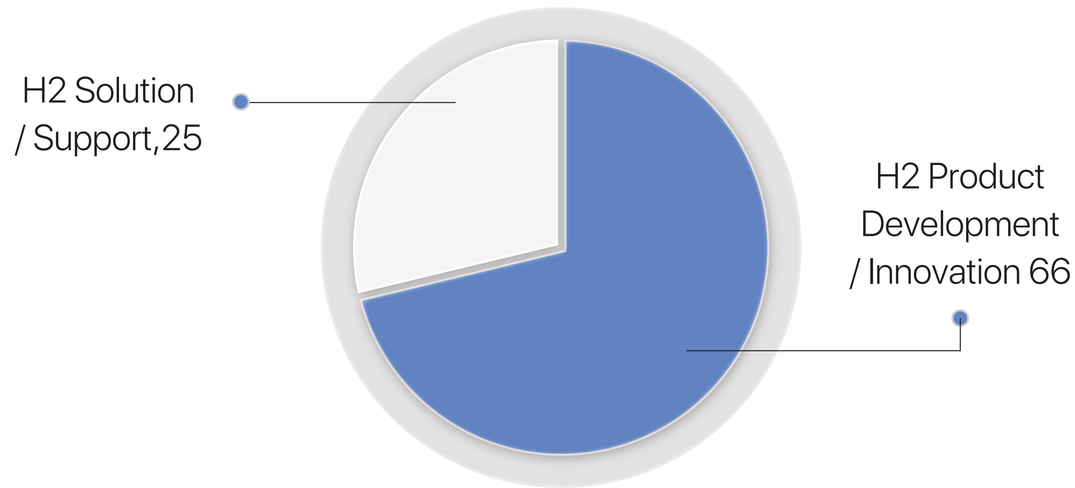


Figure 2 - H2 Solutions / Support versus Product Development / Innovation (31 October 2020)

“70% of the innovation effort is focused on Hydrogen storage”

Within the product development space, eight categories were then mapped to uncover where the bulk of the innovation effort was currently focussed. The breakdown - provided in Figure 3 - illustrates that almost 70% of the innovation effort is focused on Hydrogen storage for mobility with a strong focus on fuel cells, with the balance associated with engines, refuelling systems, and vehicles. Although many of these organisations focus on more than one aspect of Hydrogen, their dominant area of business is what has been mapped in Figure 3.

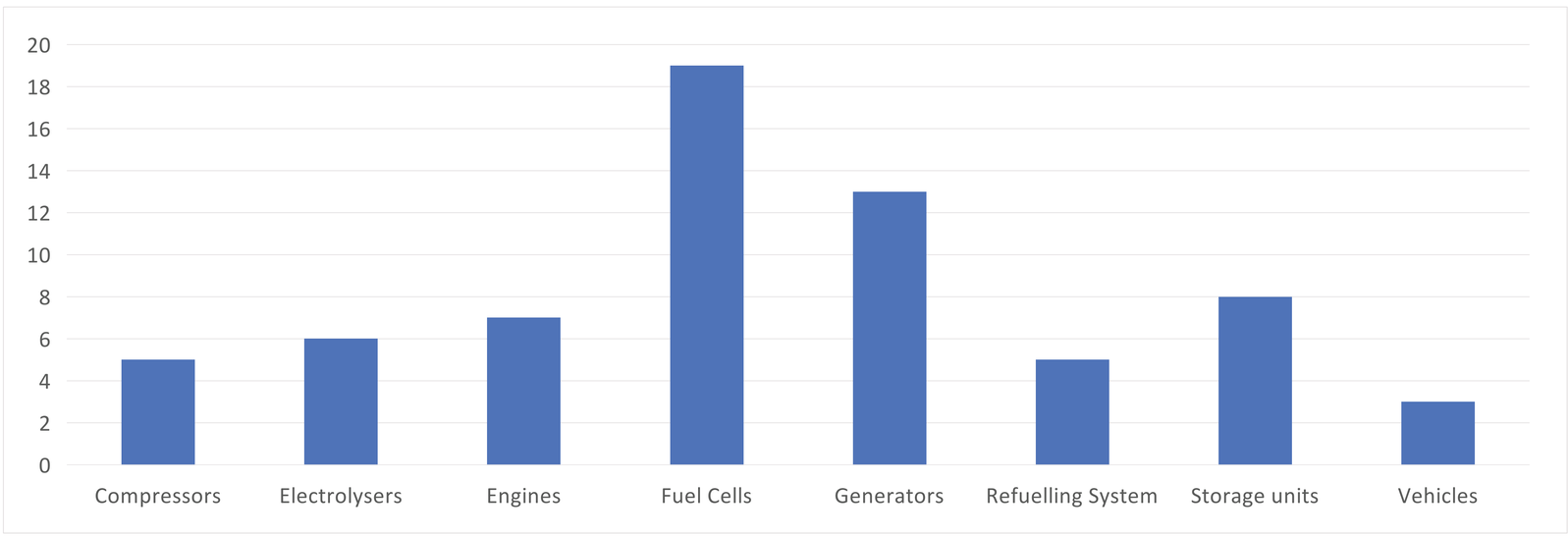


Figure 3 – Technology Provider by Technology Type (31 October 2020)

“the EIE will grow and become more comprehensive”

A comparison of the companies listed in the EIE was also carried out against a sample of prominent organisations working in the Hydrogen technology space and many were present in the EIE. Although many of the key organisations working in the Hydrogen space appear in the EIE, more encouraging is the fact that many lesser-known organisations exist in the EIE representing specialist niche technologies. At this early stage, the EIE is not a complete source of all technology providers and innovators; however, it does provide an excellent starting point. Over time it is expected that the EIE will grow and become more comprehensive once a significant number of challenges are published in the marketplace thereby encouraging further innovation and collaboration.

THE AUSTRALIAN MARKET - CHALLENGES

The HyResource website (www.research.csiro.au/hyresource/) is an excellent source of information in relation to Hydrogen projects and research in Australia. In summary, there are 54 industry projects currently at different stages in Australia.

In addition to these projects, there are 29 research projects of which 18 show a university as the lead participant. The research projects demonstrate strong industry participation with government to solve some of the bigger challenges in this sector.

The question to be asked; however, is whether universities can achieve the innovation required for the energy transition in the timeframe required to support the economy, and achieve the necessary carbon reductions. Alan Dormer[5] (CEO of Australian decision-support software developer Opturion) writes in a recent article that "Our track record of commercialising research falls way behind that of the USA, which funds research in a different way. One contributing factor is that the Defense Advanced Research Projects Agency (DARPA) provides significant funds (currently US$3.5 billion) to academia (to discover and invent) and the private sector (to innovate)." This is an interesting observation. Dormer goes on to explain why the current model has not worked and that "the industry partners seek innovation while the universities seek invention and discovery."

RECOMMENDATIONS

"the EIE can be used to fast track innovation and provide a framework for kickstarting global collaboration in Hydrogen."

In this short article the authors have demonstrated how the EIE can be used to fast track innovation and provide a framework for kickstarting global collaboration in Hydrogen. Hydrogen is often touted as the fuel of the future and has excellent environmental credentials when produced using renewable energy. The COVID-19 pandemic has brought many new challenges; least of all amongst these is resourcing and funding for opportunity innovation in parallel with reduced timelines to develop survival innovation: factors thrust upon many organisations from private enterprise to government.

As indicated, our interest is to continue to build a network. We welcome your thoughts and are keen to collaborate with innovators and enterprises willing to explore the challenges and opportunities outlined in this paper (Hydrogen or other). Please reach out to either of the authors via LinkedIn

REFERENCES

1) CSIRO, HyResource website; https://research.csiro.au/hyresource/
2) Australia's National Hydrogen Strategy; COAG Energy Council, 22 November 2019, Chaired by Dr Alan Finkel AO
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5) Making Sense of Industry Research Collaboration by Alan Dormer. Published by InnovationAus.com; 2nd November 2020

About EarlyBirds

EarlyBirds **https://earlybirds.io** is a Business to Business (B2B) platform for Innovators (Startups/Scaleups/Mature) and Early Adopters to exchange value early on. EarlyBirds building Innovation Ecosystem by bringing Subject Matter Expert (SME) Consultants, Innovators and Early Adopters organisations.

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Solution oriented. Motivated by building successful, cohesive teams, bringing resources and infrastructure to energy projects and operations. Collaboration and relationship management are key motivators.

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