A step change for industry

The ground-breaking Hycel project will demonstrate it's possible to incorporate hydrogen into the Australian transport and energy markets, **Dr. Adrian Panow**, Director of **Deakin Energy**, tells H2 View Editor **Joanna Sampson**.

Hydrogen has moved beyond being a research curiosity. It has enormous potential to be a central theme of how we approach our climate change objectives. But in order to do that, industry has to not only be involved, but also create the environment in which its commercial product exists. The research will underpin this.

It was against this backdrop that the ground-breaking clean energy research centre Hycel was born. Strategically located at Deakin University's Warrnambool campus in Victoria, Australia, along a key transport corridor that connects industries, communities and resources, Hycel will test new hydrogen technologies to cut emissions in heavy transport and replace natural gas in homes and businesses – two sectors of the economy that are most difficult to decarbonise.

Australia currently has no such facility for testing hydrogen solutions at scale. Hycel will fill this gap by leveraging Deakin University's strategic industry partnerships and research expertise in advanced materials, energy systems, IT and social sciences. Hycel will be a 'living laboratory' that translate lab results into real-world solutions.

"Because of Hycel, Australian researchers will have a pathway for their developments to enter global markets. Hycel will demonstrate that it's possible to incorporate hydrogen into the Australian transport and energy markets safely and in a commercially-viable way," Dr. Adrian Panow, Director of Deakin Energy, told H2 View.

"No matter how good technologies appear in a laboratory, unless they are made available in a commercial form, they will not be available to consumers (individual and industrial). Hycel is being established to address a gap in the Australian supply chain"

"A customer will choose, amongst other things, on the basis of cost, convenience, environmental considerations and specific application. With the dynamic mix of energy production methods due to new technologies and awareness of climate impacts, new markets are emerging. Although hydrogen has been available for a long time, its importance in this new energy landscape as a clean fuel, as a form of energy storage and as a mechanism to make electricity grids more robust is only now becoming clear.

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"Research needs to be scaled up, tested and demonstrated in real applications before manufacturers will undertake production.

Integral with the technology is the need for associated training and establishment of a social licence. Consumers need to be ready to accept new technology and create market-pull."

Hycel's work is aligned to four pillars: transport, pipelines, education and social licence.

"The transport pillar is focused on optimising fuel cells and refuelling networks to help transition the heavy transport industry from diesel to hydrogen, and the pipelines pillar is testing hydrogen in natural gas infrastructure to support the safe decarbonisation of reticulated gas," explained Panow.

"In the education space, Hycel is increasing research expertise, training and community knowledge in hydrogen applications to prepare Australia for the jobs and opportunities of the future.

"Work in the social licence pillar supports the development and application of safety standards to build community awareness, acceptance and trust in a regulated hydrogen industry."

It is this combination of a social licence programme, an education programme and focused technology development at industrial scale that makes Hycel unique.

"The bold ambition and confidence from government funders and industry partners that Deakin is able to deliver infrastructure and innovation which links directly to market priorities is particularly notable," Panow added.

On the subject of funding, Deakin University announced a landmark $7m investment from the Australian Commonwealth government and a further A$9m of Victorian state government funding to progress Hycel to the 'technology phase' of the programme. Hycel's 'establishment phase' delivered research, safety, training and regulatory foundations in hydrogen over an initial 12-month period, which was supported by A$2m of Commonwealth funding.

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"The technology phase will see the construction of Hycel Technology Hub, one of Australia's first facilities for safely testing, manufacturing, demonstrating and training in hydrogen fuel cell technologies," Panow said.

"Hycel aims to grow Australia's hydrogen economy and deliver clean and affordable energy solutions that meet Australian and Victorian emissions reduction targets."

'Step change for industry'

Current research projects at Hycel include PEM fuel cell manufacturing and testing for heavy vehicles, fuel cell application pilots, refuelling network optimisation, gas infrastructure safety and compatibility, hydrogen gas monitoring systems and social licence evaluation. >>

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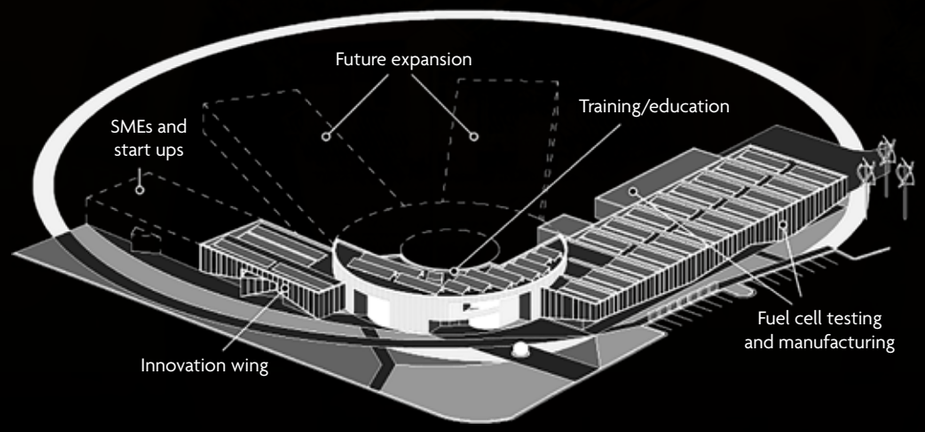
Figure 1. Hycel Technology Hub



Source: Deakin Energy

>> Explaining the main motivation behind the research being conducted at Hycel, Panow said, "Global companies producing fuel cell transport solutions have been clear that they do not source external innovation unless it has been demonstrated at scale. For Hycel, this means that it's necessary to incorporate versatile assembly and testing equipment for fuel cell production capable of delivering fuel cell stacks of hundreds of kilowatts, and deploying these in industrial settings.

"The hydrogen campus programme is in response to potential complete decarbonisation of natural gas networks using hydrogen. This programme is a step change for industry.

"Building on the Future Fuels Cooperative Research Centre Hydrogen Testbeds project which is already operating on campus to examine gas infrastructure charged with 100% hydrogen, the feasibility to convert the Deakin Warrnambool campus to hydrogen in a safe way is being examined."

So what can other countries learn from the work Deakin University is doing?

"Step changes in technology development and adoption require large, focused investment. Good science alone isn't enough. It needs to be communicated, demonstrated and supported with a capable workforce. Collaboration is essential but so is concentrated (rather than dispersed) effort," Panow replied.

"Throughout the development of Hycel, it has been challenging to maintain our focus on its four pillars of transport, pipelines, education and social licence, but the benefits are now being realised with funding and industry partner commitments secured."

"The Australian industrial environment, particularly for transport and mining is harsh and remote"

Looking at Australia and its use of hydrogen, Panow said there has been more recent recognition that hydrogen presents a way to decarbonise sectors in the Australian economy which are difficult to address in other ways, particularly heavy transport and natural gas.

"This is the opportunity Hycel is responding to," he added. "Furthermore, limited availability of low cost renewable energy in some countries, particularly Europe and Japan, results in imported hydrogen and hydrogen derivatives from countries with abundant renewable resources being more cost-effective."

On how Australia's demand and use case for hydrogen will differ from the rest of the world, Panow concluded, "The Australian industrial environment, particularly for transport and mining is harsh and remote. Diesel and natural gas play a large role. Batteries are a poor energy storage mechanism in these applications. Hydrogen addresses many of the challenges for industries seeking to decarbonise.

"An abundance of renewable energy, existing and potential, will enable production of green hydrogen at scale and at low cost. We therefore have the potential to create both domestic and export hydrogen – and its associated products such as ammonia – markets to create demand." H2V