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New NUS lab to take hydrogen research to real-world settings

Low-carbon hydrogen could account for 50% of Singapore's energy needs by 2050

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A new laboratory has been launched to help translate hydrogen research and innovation into real-world applications for scaling and commercialisation.

This comes as Singapore has been looking to use low-carbon hydrogen to decarbonise its economy, with the fuel possibly accounting for 50 per cent of its energy needs by 2050.

Speaking at the launch of the National University of Singapore's (NUS) Centre for Hydrogen Innovations (CHI) Laboratory on July 25, Second Minister for Trade and Industry Tan See Leng said the centre is the first of its kind in South-east Asia, and will help small and medium-sized enterprises develop quick prototypes and conduct testing to help translate these hydrogen technologies to real-world settings.

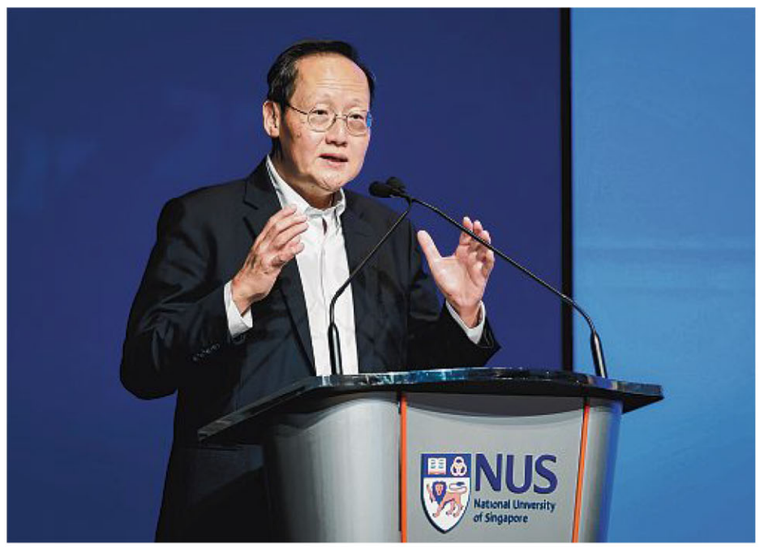
He noted that CHI first opened its doors in 2022 as a virtual centre, and had supported more than 17 projects with $4.2 million in grants to advance hydrogen research.

In 2022, The Straits Times reported that the $25 million centre will focus on the local production of green hydrogen, as well as hydrogen storage and transport. Hydrogen is considered a clean fuel as it does not produce any planet-warming carbon dioxide when burned.

Asked about the status of the 17 projects and their timeline to commercialisation, CHI centre director Yan Ning told ST that each project received around $250,000 in funding, with the purpose of stimulating research activities and experimenting with different types of hydrogen technology.

"Of course, some of these projects will die out, but around seven or eight of them have grown into much larger ones. These then receive funding from industry and government support, and scale up to the pilot stage," said Professor Yan.

For example, one such project, which garnered around $8 million in funding, involved developing a system that can crack and combust ammonia for power generation in a way that is energy-efficient and maximises land-use efficiency, he added.



Manpower Minister Tan See Leng speaking at the launch of the NUS Centre for Hydrogen Innovations Laboratory on July 25. ST PHOTO: GAVIN FOO

Ammonia has been a hot area of focus as a hydrogen carrier, as it is relatively stable and can be stored and transported at ambient temperatures. Ammonia can either be combusted directly for electricity generation or "cracked" to separate hydrogen from it, although this reaction would require very high operating temperatures.

The ammonia cracking project has since received funding from the Government's Low-Carbon Energy Research initiative, and the researchers are collaborating with Siemens Energy on their endeavour, Prof Yan noted.

Having the new CHI lab will therefore be beneficial for such larger-scale projects as it is equipped with more specialised equipment, for example, to handle and store ammonia safely, he added.

Given the nascency of hydrogen technology, Dr Tan, who is also Manpower Minister, pointed to the significant technological breakthroughs needed to enable the deployment of hydrogen at scale and in a cost-effective manner.

"We must prioritise raising the technological readiness levels and the market readiness levels of hydrogen technologies. This requires close collaboration across all stakeholders across the ecosystem," he added.

For example, the Energy Market Authority (EMA) and Maritime and Port Authority of Singapore (MPA) have launched a request for proposal for an ammonia solution for bunkering and power generation on Jurong Island, working closely with industry partners to do so.

Both agencies said in a joint statement on July 25 that it has selected two consortia – out of six shortlisted consortia in 2023 – to conduct engineering, safety and emergency response studies for the project.

The two consortium leads are Keppel's Infrastructure Division and Sembcorp-SLNG.

At the next phase, one of the two bidders will be selected as the lead developer of the project, which will involve generating 55MW to 65MW of electricity from imported low- or zero-carbon ammonia via direct combustion in a combined-cycle gas turbine.

The developer will also have to facilitate ammonia bunkering at a capacity of at least 100,000 tonnes per annum, starting with shore-to-ship bunkering, followed by ship-to-ship bunkering.

EMA and MPA said: "Given the nascency of the technology and global supply chains, the Government will work closely with the appointed lead developer to implement the project."

The Government aims to select a lead developer by the first quarter of 2025.

The NUS CHI is also looking to create a talent pipeline such that workers can contribute to different components of the hydrogen economy, by introducing courses for both adult learners and undergraduates.

The centre currently has 32 principal investigators and four PhD students, and it plans to recruit about 10 scholars with interdisciplinary expertise and train 10 PhD students, said NUS in a statement on July 25.

Dr Tan stressed the importance of building a pipeline of talent that is ready for a low-carbon future, given that many new low-carbon technologies will have applications across multiple sectors, in energy and chemicals, chemical storage, marine bunkering, power generation and aviation.

"Existing talent in these industries will need to be equipped with the necessary knowledge and skills to seize new opportunities," he said.

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