



Deputy Prime Minister Heng Swee Keat (second from right) visiting the Cambridge Centre for Advanced Research and Education in Singapore on Dec 4. DPM Heng said the centre's work is closely aligned with the goals outlined in the Singapore Green Plan 2030, and achieving Singapore's net-zero emissions goal by 2050. PHOTO: CAMBRIDGE CARES

Projects to wean chemical, energy sectors off fossil fuels

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The Cambridge Centre for Advanced Research and Education in Singapore (Cares) is helming two projects worth \$31 million collectively to research processes that can make the chemical manufacturing industry and energy systems here less reliant on fossil fuels.

The centre said on Dec 5 that these projects, which started in October, are among nine research projects under a \$90 million programme announced in July to help decarbonise Singapore's energy and industrial sectors.

Cambridge Cares, the University of Cambridge's first research centre outside the UK, was established in 2013 in collaboration with NTU and NUS. The Singapore Government funds the centre.

In the first project, called Hydrogen and Ammonia Combustion in Singapore, researchers are investigating the use of hydrogen and ammonia to generate power – as well as for use in the aviation and maritime industries – and to minimise pollution caused.

This will also help ease the transition to these fuels in the Singapore energy system, as the country may adopt them in the future and new equipment will be needed to

process them.

One of the tools the centre – located in Kent Ridge – is using for this project is a laser diagnostic system to study the burning process of hydrogen and ammonia and analyse the emissions during the process.

The information will then be used to understand how the emissions, which may contain greenhouse gases such as nitrous oxide, can be minimised. The data will also help in the effective use of ammonia and hydrogen in equipment such as gas turbines in the future.

Cambridge Cares software developer Tan Yong Ren said that besides power generation, the research findings can also be applied to industries, such as the maritime industry, “in terms of engine design and how we can fit the current engines to use these kinds of fuels in the future.”

Conventional engines are currently optimised for fossil fuels, Dr Tan said. “The project can also help to train engineers in Singapore to be equipped with the latest research on ammonia and hydrogen,” he said.

The other project, named Sustainable Manufacture of Molecules and Materials in Singapore, will help to develop methods that best convert fossil-free starting materials into products for the chemical industry. This aims to address the

industry's dependence on conventional petrochemical processes that rely on fossil-based carbon sources, which are unsustainable and contribute significantly to greenhouse gas emissions.

The centre will tap technology that uses robotics and machine learning to make pharmaceutical products from raw materials in an automated system.

This can also be adapted to use cleaner and more sustainable carbon sources from bio-based materials to build these final products.

Deputy Prime Minister Heng Swee Keat, who is the chairman of the National Research Foundation (NRF), said on Dec 5 that the need to tackle climate change and its impact grows ever more urgent.

DPM Heng, who visited the centre on Dec 4, said: “From hydrogen combustion and laser-based combustion diagnostics to the development of cleaner fuels for gas stoves, their work is closely aligned with the goals outlined in our Singapore Green Plan 2030, and achieving Singapore's net-zero emissions goal by 2050.”

Professor Markus Kraft, director at Cambridge Cares, said: “Decarbonisation is a global problem and in a country like Singapore, a large portion of the country's business model is tied to petrochemicals.”

He added: “To decarbonise the country, we must look at the busi-

nesses and industries that will be facing great pressure to change existing systems and processes.

“With the new projects, I anticipate we will be able to catalyse our research to create a greater impact in Singapore, such as transferring our knowledge and results to industry and generating new partnerships with maritime, energy and chemical companies.”

The two projects are among nine research projects – each taking between three and five years – under the NRF's Create Thematic Programme In Decarbonisation that was launched in July.

NRF had said the programme will contribute towards building Singapore's capacity in hydrogen utilisation, developing new insights on the combustion behaviours of zero-carbon fuel blends and building ammonia-ready fuel cells for power generation.

This followed the October 2022 launch of Singapore's National Hydrogen Strategy, which will accelerate the development and deployment of hydrogen as a major decarbonisation pathway.

By 2030, there will be at least nine hydrogen-ready power plants here, and low-carbon hydrogen could potentially account for around 50 per cent of Singapore's electricity mix by 2050.

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