Bringing hydrogen to Singapore for clean fuel

To accelerate the commercial use of hydrogen (H2) as a renewable energy source in Singapore, Nanyang Technological University (NTU) and various industry collaborators are working on improving the efficiency of extracting hydrogen from liquid organic hydrogen carriers (LOHCs). LOHCs are organic compounds that can be chemically induced to store and release hydrogen, making them a convenient way to transport hydrogen from overseas production facilities without having to liquefy the gas by extreme cooling and high pressure.

One company, Chiyoda Corp, has already developed its own hydrogen storage and transport technology. This is how it works:

CLOSED-LOOP GREEN H2 TRANSPORT

1 H2

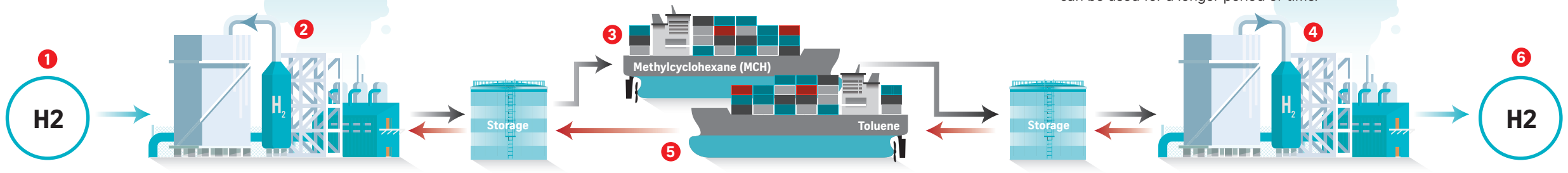
Green hydrogen is produced by splitting water into hydrogen and oxygen using electricity from renewable sources, like wind and solar power, which ensures that no carbon dioxide is emitted in the process – making the gas a clean fuel. This can be done in countries such as Australia and Chile, which have an abundance of renewable energy.

3 Transport

MCH is a liquid at ambient temperature and pressure, and can be safely stored and transported using petroleum tankers.

4 Dehydrogenation

In Singapore, the hydrogen is released from MCH via a chemical reaction known as dehydrogenation. Researchers at NTU aim to reduce the cost of the hydrogen extracted, by improving the efficiency of the reactor needed for the dehydrogenation process and improving the stability of the catalyst — a substance that speeds up the chemical reaction — so that it can be used for a longer period of time.



2 Hydrogenation

During this process, hydrogen is added to an organic liquid compound, toluene, forming another liquid compound known as methylcyclohexane (MCH).

5 Reusing raw materials

Toluene, the by-product of the dehydrogenation process, can be repeatedly recycled as a raw material for producing MCH.

6 H2 fuel

Trials include testing the viability of hydrogen-powered vehicles with PSA Corp. Eventually, hydrogen can be used in sectors such as power generation, transport and town gas.

Source: NANYANG TECHNOLOGICAL UNIVERSITY, CHIYODA CORPORATION STRAITS TIMES GRAPHICS