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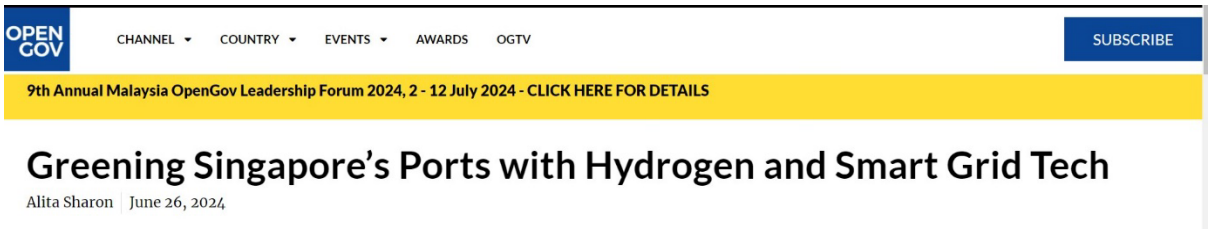
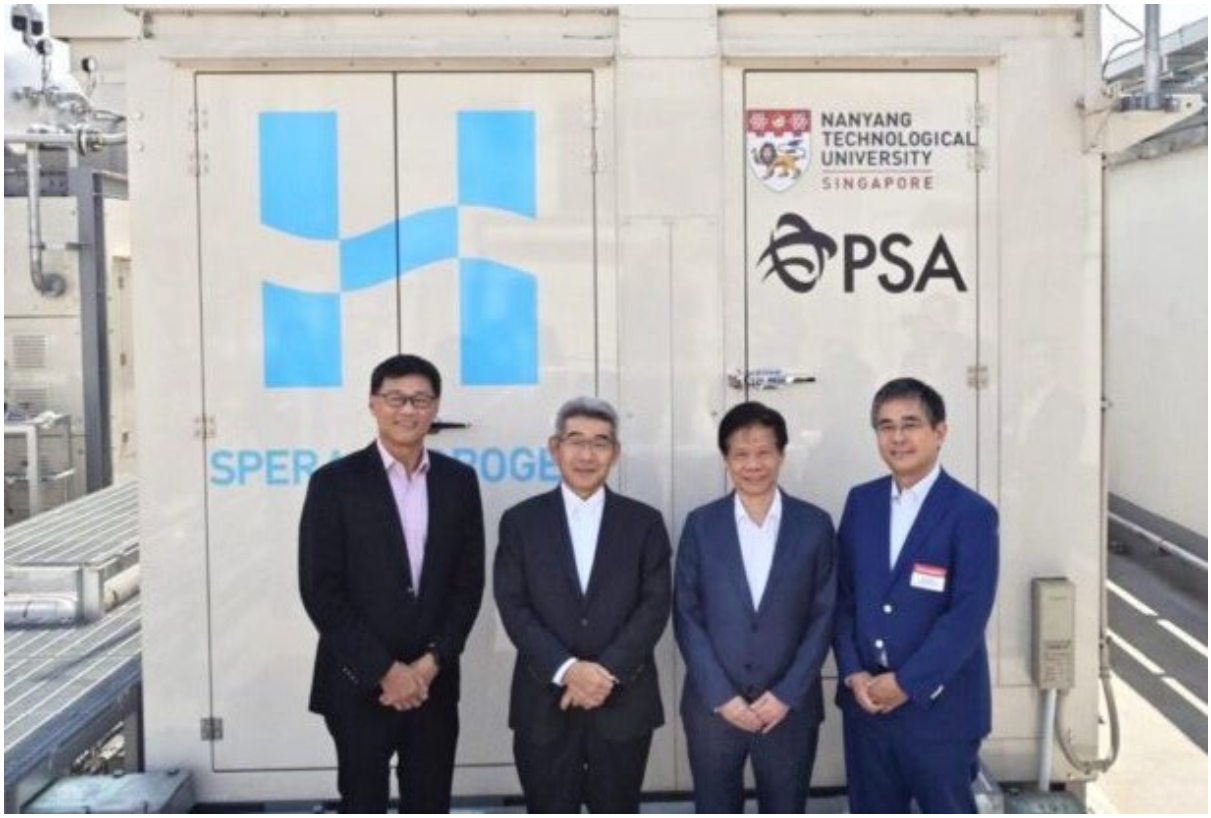


Greening Singapore's Ports with Hydrogen and Smart Grid Tech

Alita Sharon | June 26, 2024

Nanyang Technological University, Singapore (NTU Singapore), PSA Singapore (PSA), and a Japanese corporation have embarked on a groundbreaking initiative to explore the transportation and storage of hydrogen using methylcyclohexane (MCH).



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This project marks a significant advancement in sustainable energy solutions, leveraging MCH's ability to store hydrogen in liquid form under ambient conditions before extracting it for use as a clean fuel.

Central to this collaboration is PSA's deployment of the first hydrogen refuelling station at Pasir Panjang Terminal in Singapore. The initiative aligns with Singapore's commitment to sustainable practices and technological innovation in its port operations.

This facility not only facilitates the extraction of hydrogen from MCH but also supports hydrogen fuel cell electric prime movers, enabling cleaner horizontal transportation within the port.

Singapore has also introduced its inaugural energy storage system (ESS) at the Pasir Panjang Terminal as part of a broader $8 million partnership between the Energy Market Authority (EMA) and PSA Corporation Ltd (PSA). This Smart Grid Management System

(SGMS) aims to enhance the terminal's energy efficiency by 2.5% and reduce its carbon footprint by 1,000 tonnes of CO_2 equivalent annually. The ESS, complemented by solar photovoltaic panels, forms a robust infrastructure that utilises machine learning for real-time energy demand forecasting and management.

Alvin Foo, Head of New Technologies and Sustainability at PSA, emphasised the strategic role of PSA in driving innovation and sustainability in Singapore's port operations. He highlighted the collaborative efforts with EMA to maximise the potential of battery energy storage solutions, ensuring cleaner and more efficient energy utilisation across their facilities. The integration of port automation further enhances operational efficiency, underscoring PSA's commitment to resilience in energy management.

Beyond optimising internal operations, PSA's ESS also participates in Singapore's National Electricity Market to provide ancillary services and generate revenue during off-peak periods. This dual functionality underscores the project's versatility and contribution to Singapore's broader energy ecosystem.

The testbed at Pasir Panjang Terminal builds on successful proof-of-concept (PoC) experiments led by NTU, focusing on the efficient and economical transport of hydrogen using LOHC technology. These initiatives are pivotal in expanding global hydrogen supply chains and validating industrial-scale storage and dehydrogenation processes. Scheduled until mid-2025, the trial aims to validate the feasibility of storing and extracting hydrogen from LOHC in an industrial setting, supporting on-site refuelling operations.

NTU's Vice President (Industry), Lam Khin Yong, highlighted the university's pivotal role in developing catalysts and reactors for hydrogen extraction, translating laboratory successes into practical

applications. The collaboration underscores NTU's commitment to sustainable energy solutions and its support for Singapore's vision of environmental stewardship through impactful innovations.

The initiative also aligns with international collaborations, such as the Singapore-Australia Green and Digital Shipping Corridor (GDSC), aimed at promoting sustainable shipping practices and fostering technological advancements in maritime operations. Recent propulsion and manoeuvrability trials of the Fortescue Green Pioneer at the Port of Singapore further exemplify global efforts to integrate green technologies into shipping practices, supported by partnerships with entities like the Maritime and Port Authority of Singapore (MPA).

The partnership between NTU, PSA, and their collaborators represents a pivotal step towards integrating sustainable energy solutions into Singapore's port operations. By harnessing the potential of hydrogen storage and using advanced energy management systems, the project not only enhances operational efficiency but also sets a precedent for global maritime sustainability initiatives.

As these technologies evolve, they promise to shape the future of energy-intensive industries, demonstrating Singapore's leadership in adopting and promoting innovative environmental practices.