

Hydrogen produced from offshore wind in China can help Japan reach its greenhouse gas emissions goals

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Japan's Green Growth Strategy signals a commitment to net-zero greenhouse gas emissions by 2050—and hydrogen produced from



renewable energy can play an important role in this shift. A team of researchers from Harvard University, Shandong University, China University of Petroleum Beijing and Huazhong University of Science and Technology have explored the possibility of producing hydrogen by electrolysis using power generated from offshore wind in China.

"This research helps build the case that it is not only possible for Japan to meet the formidable challenge of transitioning to net-zero emissions, it also could be cost-competitive," explains lead author Shaojie Song, Research Associate in the Harvard-China Project on Energy, Economy and Environment in the John A. Paulson School of Engineering and Applied Sciences at Harvard University. "Our research shows that Chinese-produced hydrogen could be delivered at a volume and cost consistent with Japan's future projections."

The team analyzed the potential for a green hydrogen supply chain to Japan delivered from offshore wind produced in China on an hourly basis from every Chinese coastal province, considering several possible wind investment levels, electrolysis technologies and transport mechanisms. The generated hydrogen could be delivered to Japan either as <u>liquid hydrogen</u>, bound to a chemical carrier such as toluene, or as a component of ammonia.

The researchers determined that offshore wind power from China could provide potentially as much as 12 petawatt-hours of electricity annually. They modeled the cost implications of the offshore wind location; chemical conversion processes; and storage, transport, and delivery methods. The team found that Chinese sources could supply costcompetitive hydrogen to Japan for 2030 even if offshore wind deployment follows a high-cost scenario.

"Green hydrogen production in China would not only benefit Japan's netzero transition, but it also has the potential to benefit both country's



plans for future carbon neutrality," explains author Michael B. McElroy, Gilbert Butler Professor of Environmental Studies at Harvard University and Chair of the Harvard-China Project. "A closer commercial relationship between China and Japan could facilitate comparable crossfertilization of energy advancements like fuel cell technologies. And green hydrogen production from <u>offshore wind</u> in China has the potential to expand also to South Korea, which has similarly ambitious plans for investments in expanded use of hydrogen as a fuel and feedstock."

The research was published in Nature Communications.

More information: Shaojie Song et al, Production of hydrogen from offshore wind in China and cost-competitive supply to Japan, *Nature Communications* (2021). DOI: 10.1038/s41467-021-27214-7

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