

Japan carbon pledge boosts hopes of ammonia backers

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Ammonia is already made on a massive scale and exported throughout the world to make fertiliser

Japan's pledge to become carbon-neutral by 2050 is offering hope to industry heavyweights pushing ammonia as the fuel of the future—but

critics say the corrosive gas is still far from a clear-cut clean energy.

Burning [ammonia](#), unlike fossil fuels, does not emit planet-warming carbon dioxide, and it is easier to transport than [liquid hydrogen](#), also touted as a potential source of green fuel.

That has attracted the interest of a consortium of major Japanese firms, keen to launch large-scale imports into the country, which has few fossil fuel reserves and limited nuclear capacity since the Fukushima disaster.

"Ammonia is the cheapest and most viable option" for Japan, Shigeru Muraki, executive vice-president and representative director of the Green Ammonia Consortium, told AFP.

Formed last year, the consortium groups 70 major Japanese firms who hope to use ammonia first at coal power stations and eventually at gas plants too.

The hunt for greener fuels has new urgency after Prime Minister Yoshihide Suga in October set a 2050 deadline for the world's third-largest economy—still heavily coal dependent—to reach carbon neutrality.

Muraki believes ammonia could generate a tenth of Japan's electricity needs "before 2040."

But whether the gas can provide a silver bullet depends a lot on future technological innovations, not least because most currently available methods for producing ammonia themselves emit carbon dioxide.

Grey, blue... and green?

Ammonia—composed of hydrogen and nitrogen—is already produced

en masse from fossil fuels and exported worldwide to make fertiliser.

It maintains a liquid state at around -33 degrees Celsius (-27.4 degrees Fahrenheit), meaning it is much simpler and cheaper to transport than liquid hydrogen at -253 degrees Celsius.

In eco terms, the holy grail is "green" ammonia, manufactured with chemical reactions involving water, air and sustainable electricity. It is 100 percent renewable and carbon-free, according to the Royal Society, an independent scientific organisation.

Researchers hope "green" ammonia could one day power a low-carbon planet, but for now most ammonia is "grey"—extracted from natural gas or coal.

This method emits on average around 2.4 tonnes of carbon dioxide for each tonne of ammonia produced, according to the International Energy Agency—accounting for about one percent of global CO₂ emissions today.

Comparing the emissions from producing grey ammonia to those from burning coal is complicated, experts say, but they agree that it won't be considered environmentally friendly unless produced renewably.



Ammonia has also attracted attention as a possible ship fuel

Work is underway to capture and store emissions from ammonia production, creating a halfway-house product dubbed "blue" ammonia.

Muraki said the consortium hoped to "eventually use blue and green ammonia."

But, he acknowledged, for now "we will use cost-effective grey ammonia from existing suppliers, because blue ammonia will not be available for the next few years."

Douglas MacFarlane, a chemistry professor at Monash University in

Australia, said starting with "grey" ammonia "as a way of developing the supply chain and encouraging producer countries to build up their capability... makes sense, but only in the context of ultimately and fairly quickly moving to blue, then green."

And he warned that grey ammonia "also has the impact of shifting emissions from the user country to the producer country."

"That's a sensitive issue in global carbon politics," he told AFP.

There are other concerns, as burning ammonia produces polluting nitrogen oxides, which modern coal plants are built to capture, but would require adaptations at gas power stations.

Saudi test

Muraki is convinced that technology will develop rapidly in the sector, driven by demand.

"The power market is very large compared to fertiliser," he said, adding that ammonia has also attracted attention as a possible ship fuel—a global market producers will be keen to expand into.

For now, the ammonia energy market is still in its infancy.

In September, Saudi Aramco and Japan's IEEJ energy think-tank organised a shipment of 40 tonnes of blue ammonia to Japan, to be burnt experimentally in a coal power station and two small gas turbines. And even grey ammonia is still in test stages in Japan.

Environmental campaigners are unimpressed, arguing the focus should be only truly [renewable resources](#) rather than repurposing [fossil fuels](#).

Carbon capture and storage "will not materialise on a large scale by 2030, and there are many uncertainties about the costs and risks associated with these technologies", Kimiko Hirata, international director of Japanese environmental NGO Kiko Network, told AFP.

"We are also worried that the industrial and power companies will try to justify coal power with these technologies, and so delay actions to shift from coal to renewable energies."

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