



Hydrogen & synfuels are potential solutions for long-haul transportation sectors where there are few other clean energy options.



In transportation, the electric future is upon us, but there remain some transport sectors that are just really hard to electrify. Nuclear energy offers a potential path forward in a completely different role than it has played before.

HYDROGEN

Cleaning up “hard to clean” transport

In 2018, Norway became the first country in the world where a majority of all new car sales were electric vehicles. That year also saw deployment of the first electric mid-range heavy-duty trucks from companies like Tesla and Daimler.

Canada’s Corvus Energy is, right now, delivering electric energy storage systems to operators of ferries, tugboats, and even cruise ships. This is, in turn, permitting these vessels to run on electricity during nearshore marine operations, which lowers maintenance costs, reduces fuel consumption, limits emissions, and prevents potential spills from polluting waterways.

As many as 20 different electric airplane start-ups such as Ampaire, Wright Electric, Zunum Aero and even Uber are racing to see whose regional services and flying taxis take off first. They aim to deliver as soon as the early 2020s, quieter, cleaner and cheaper short-haul flights than fossil-powered planes can offer.

But what all these transport sectors have in common is that they operate over short to medium ranges for light-duty activities. Long-haul trucking, shipping and aviation fall into the category of “hard-to-clean” sectors because they are difficult to electrify. For such distances, batteries need to be much larger and heavier. Flight, in particular, presents a problem if batteries are too heavy for the planes to achieve liftoff.

As a result, the hard-to-clean transport sectors are likely going to have to depend on some sort of clean fuel instead of electrification.

Production of carbon-neutral, or even carbon-negative, synthetic hydrocarbons is one elegant solution, as this transition can be achieved by simply changing the fuel without the need to swap out the internal combustion engines of the existing fleet of long-haul planes, ships, and trucks for battery packs and electric motors.

But there’s a catch: synthetic hydrocarbons, or synfuels, need a supply of hydrogen as feedstock, and the cheapest way to produce hydrogen today is not very clean—by splitting natural gas with steam. In fact, for every kilogram of hydrogen pumped out, ten times as much carbon dioxide is also produced.

We need a better way

Electrolysis—using an electric current to split water molecules into hydrogen and oxygen instead—is clean, but incredibly energy intensive, which in turn makes it very expensive. And this is what makes nuclear an ideal candidate for clean hydrogen production.

Electrolysis is much more efficient and cheaper if water is first heated to form steam before the electric current is passed through. And production of steam is what nuclear plants do.

Researchers from all over the world are working on new processes that use heat from nuclear reactors to unlock clean and efficient hydrogen production. Initially the idea is to use both waste heat and off-peak low-cost electricity from existing plants and renewable energy sources. But ultimately, dedicated nuclear hydrogen production facilities would run 24/7, reducing costs still further by avoiding the maintenance expense of ramping production up and down.

Cleaning up the grid and electrifying everything is a common refrain heard in climate circles. This is mostly correct. But there are a handful of sectors that do not have many electrification options. The good news is that hydrogen production from nuclear power could be a driver of new solutions to put clean, long-haul transportation in motion.