Air In, Water Out: Six Interesting Facts About Fuel Cell Electric Technology

October 07, 2022

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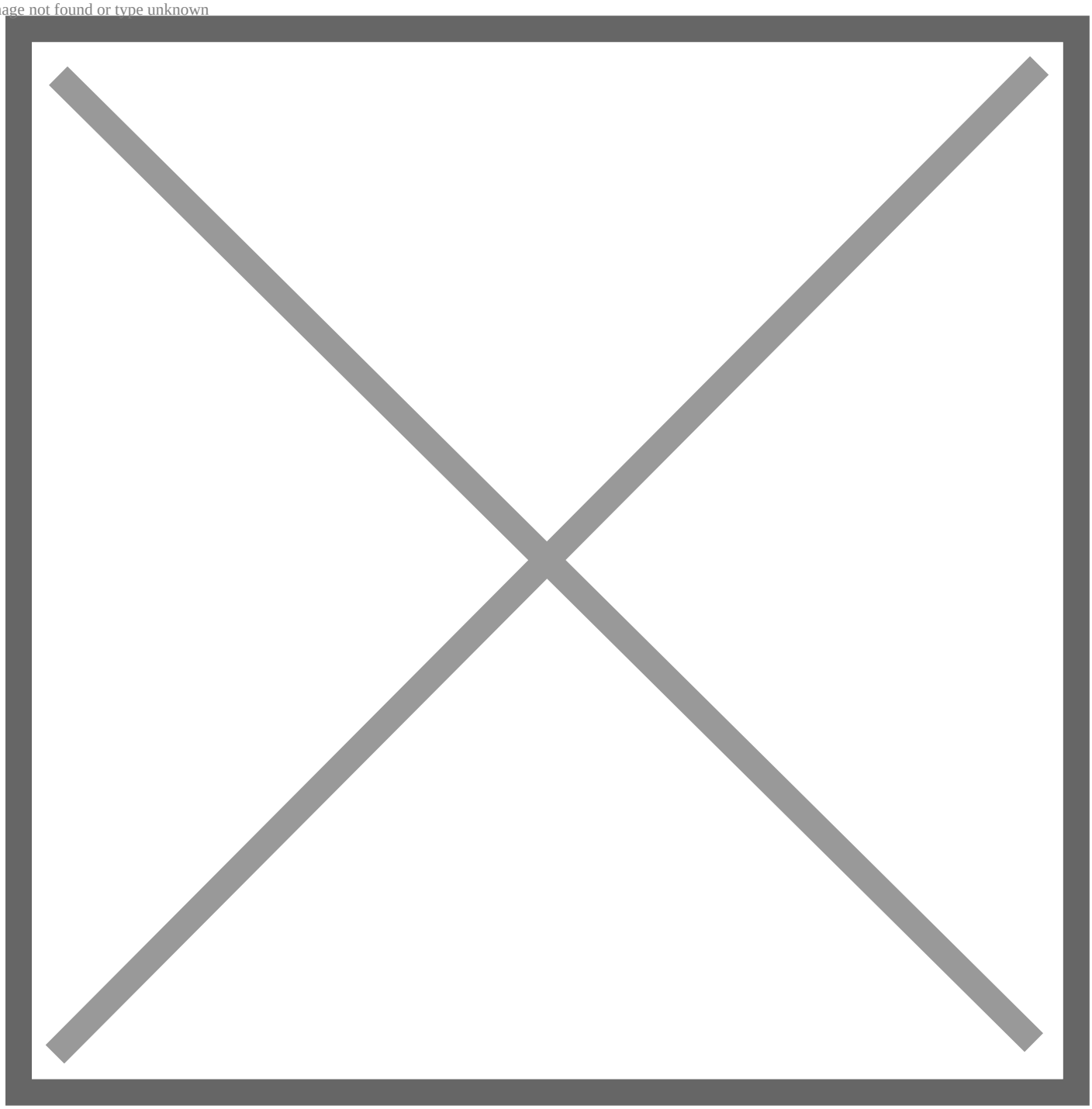
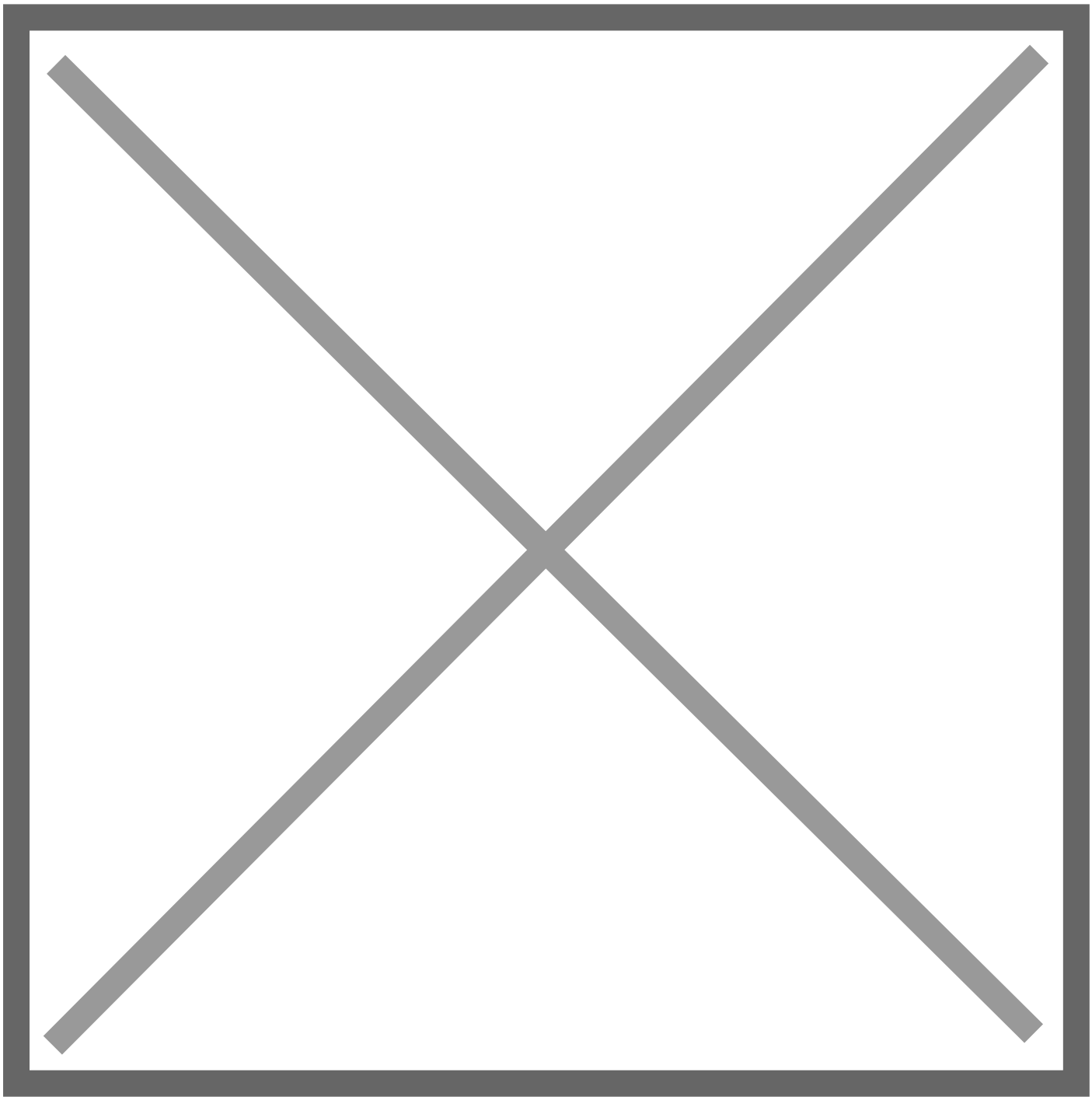


Technology is forever evolving and impacting the way we live, and hydrogen-powered fuel cell electric vehicles are a great example of this. Although it's been around longer than many might think, recent evolution in fuel cell electric technology has put it back in the mobility and automotive spotlight.

Found on Earth mostly in water, hydrogen is one of the most abundant elements in the universe, and its potential for producing clean electricity is remarkable. That's why the U.S. Office of Energy Efficiency and Renewable Energy has been recognizing Hydrogen and Fuel Cell Day since 2015. It occurs every Oct. 8, a date chosen for the atomic weight of hydrogen (1.008), and it's the perfect opportunity to brush up on hydrogen and fuel cell knowledge.

Here are six interesting facts to know about fuel cell electric technology:

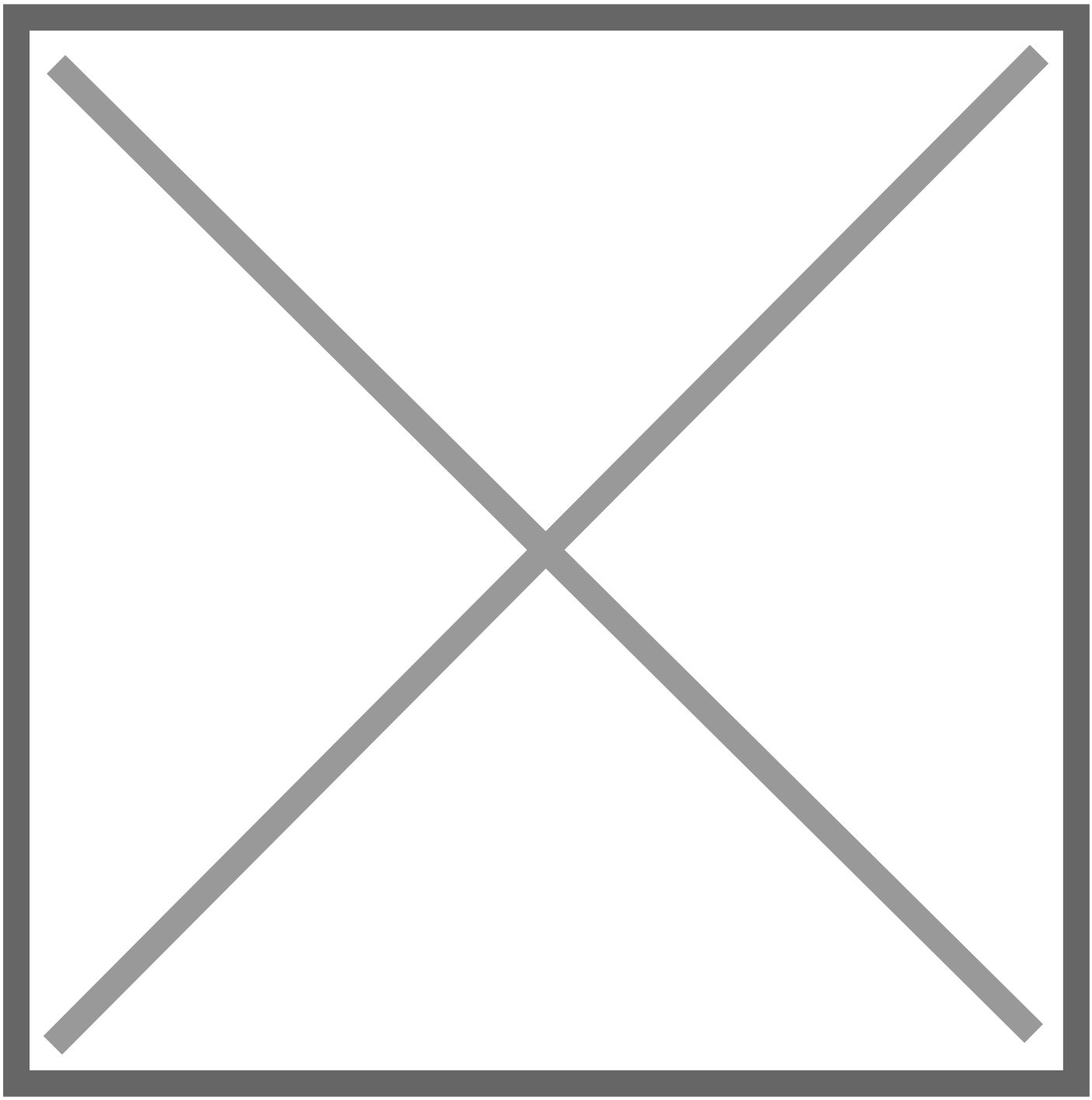
It's 90 Years Old



Few phrases sound as futuristic as “fuel cell,” but the truth is the technology has been around for almost a century. Francis Thomas Bacon invented it in 1932, years before it would take on any practical use. It wasn’t until Allis-Chalmers, the U.S. machinery manufacturer, designed a fuel cell tractor in 1959 that the technology powered its first vehicle.

Its first use? Plowing a field of alfalfa sprouts near West Allis, Wisconsin.

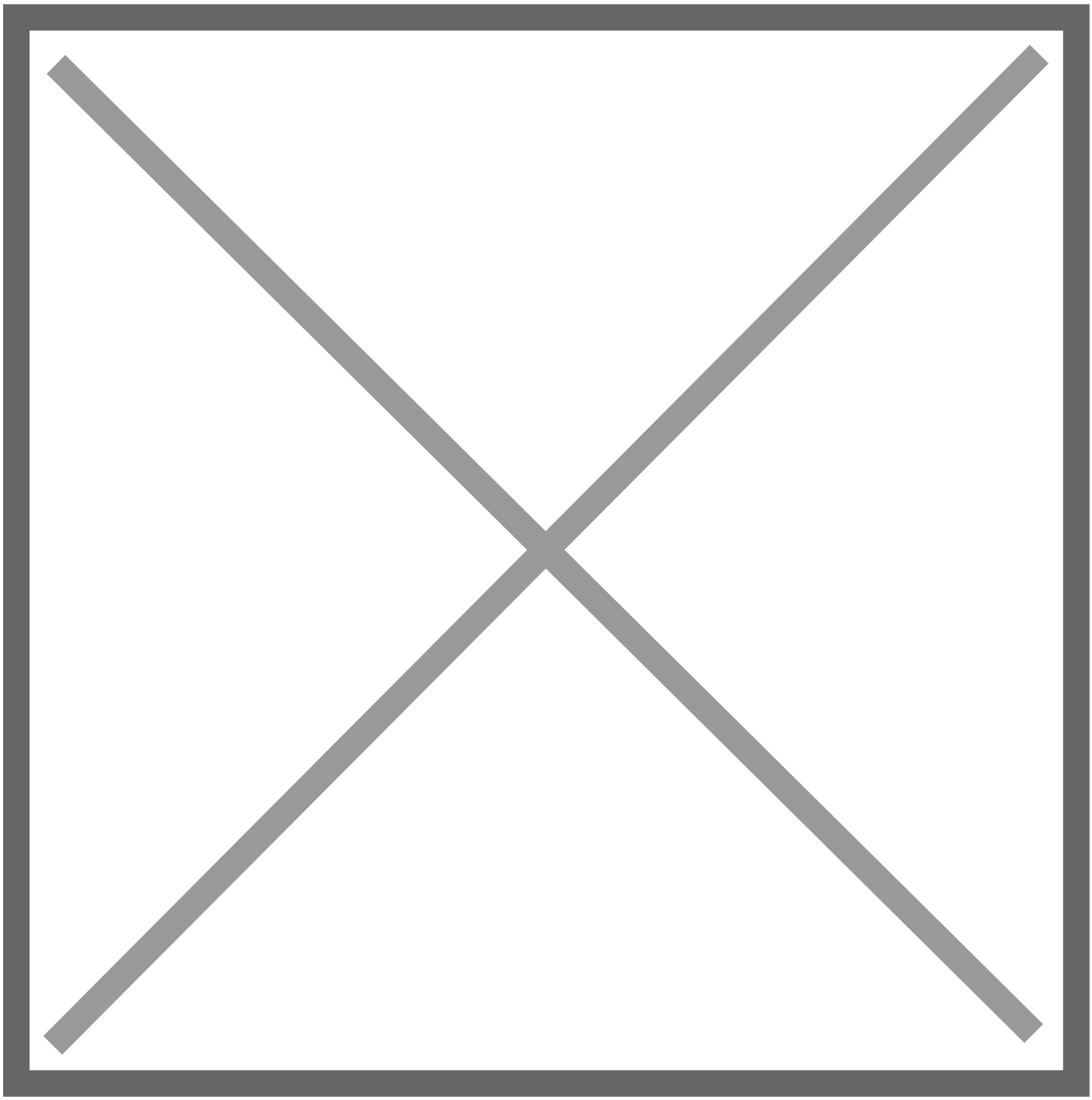
Hydrogen Was Used to Support NASA Space Shuttles



It was 10 years after that tractor completed its plow — in 1969 — that Bacon was invited to the White House, where President Nixon told him, “Without you, Tom, we wouldn’t have gotten to the moon.”

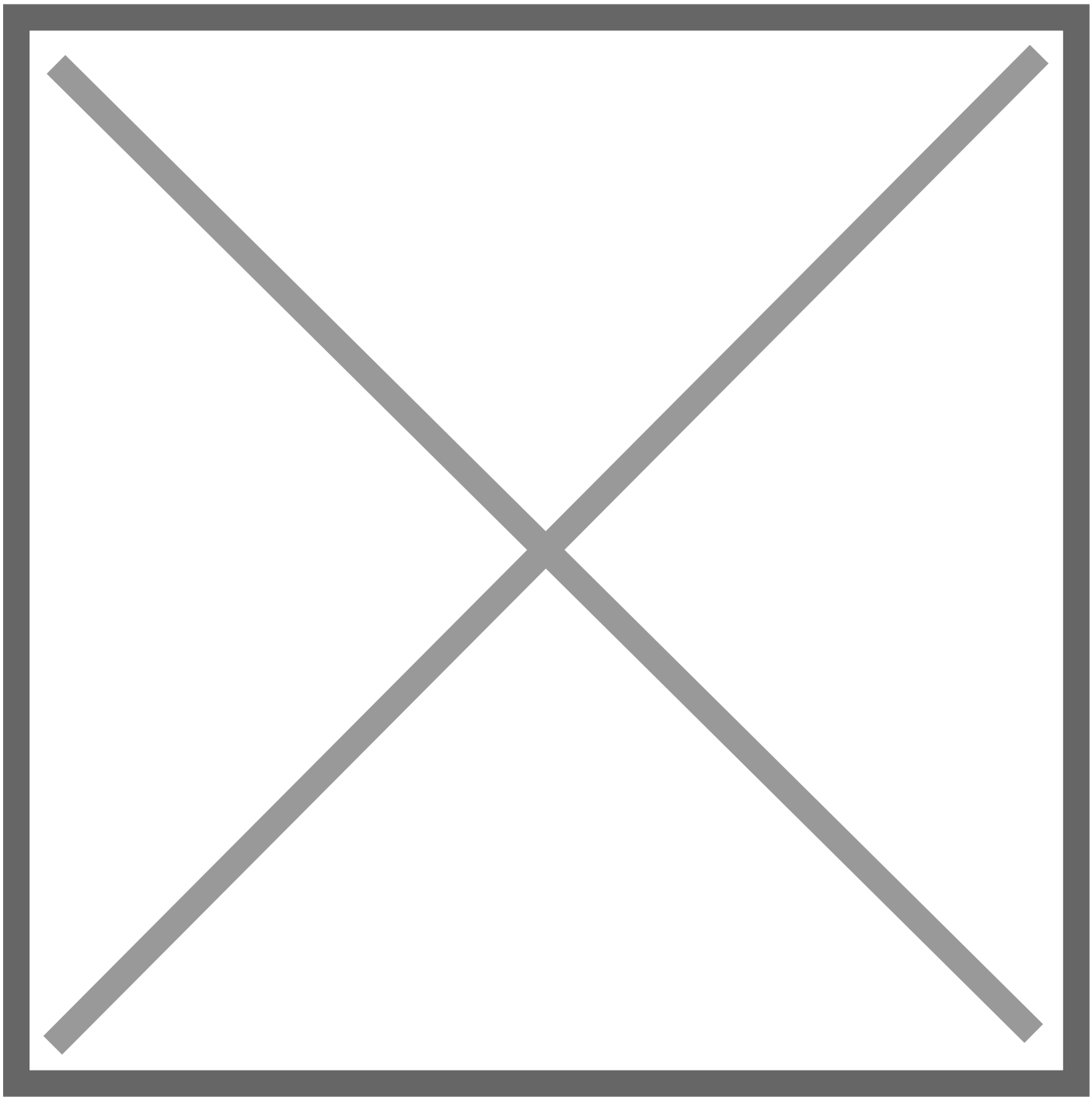
That was no exaggeration. Fuel cell electric technology powered many essentials for the Apollo 11 crew, including lights and air conditioning.

The Only Inputs Are Hydrogen and Oxygen



The beauty of fuel cell electric technology is in its simplicity. Fuel cell electric vehicles (FCEVs) need only two things to produce energy: hydrogen and oxygen. Hydrogen is pumped into the vehicle at a fueling station, similar to gas. And in the Toyota Mirai, oxygen enters through the intake grille. As the driver pushes on the accelerator, hydrogen fills the fuel cells, combines with the oxygen and produces electricity — much like a battery.

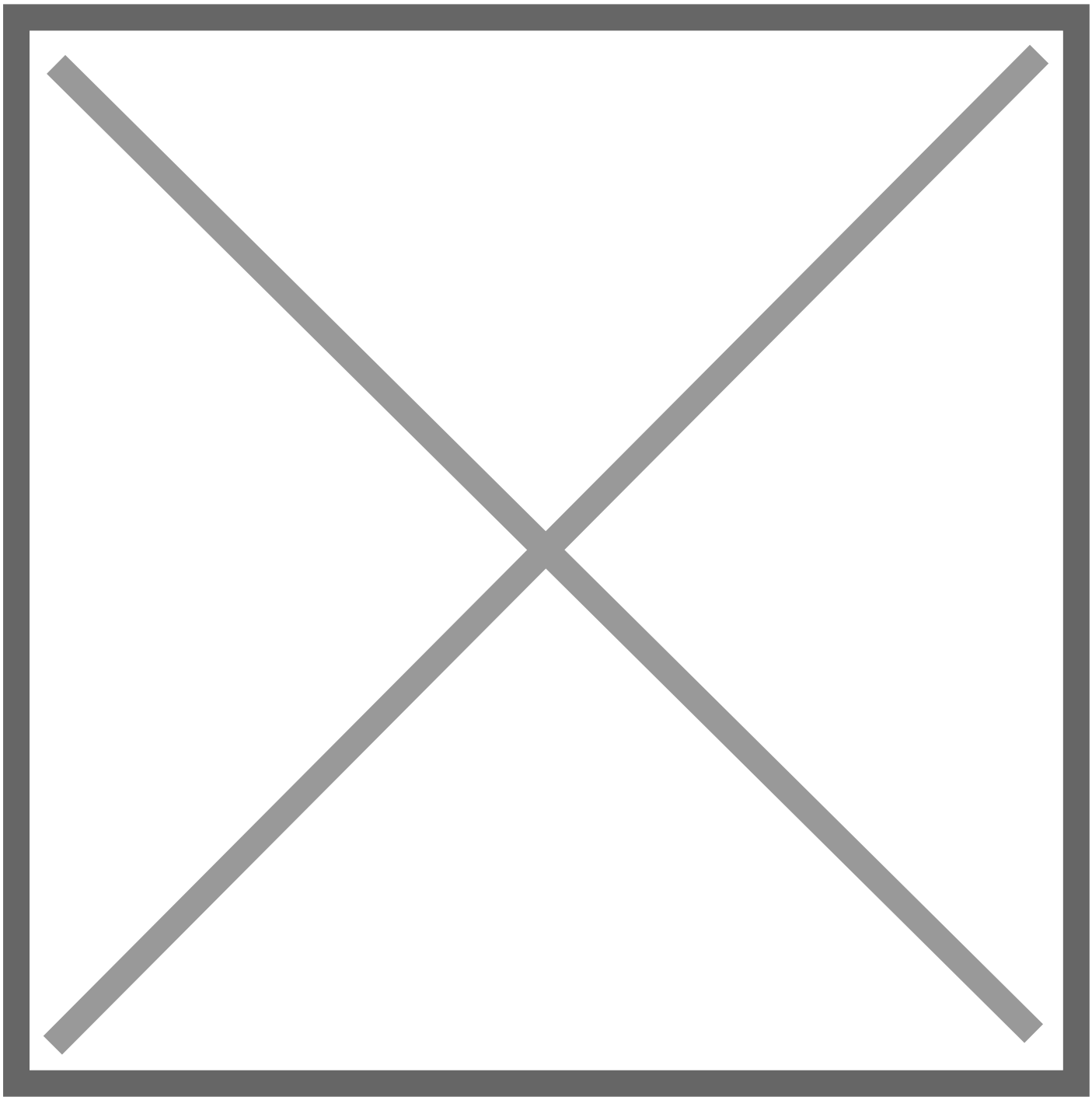
The Only Output Is Water



No heat. No smoke. No noise. The only by-product of combining hydrogen and oxygen in a fuel cell stack is water. In fact, the exhaust water was so pure and clean aboard the Apollo 11 flight that astronauts drank it.

In vehicles like the Toyota Mirai, that water simply drips out of the tailpipe. As truly zero-emission vehicles, FCEVs will play a key part in Toyota's strategy to reduce CO_2 emissions from new vehicles.

The Toyota Mirai Comes With Three Years' Worth of Complimentary Fuel Up to $15,000

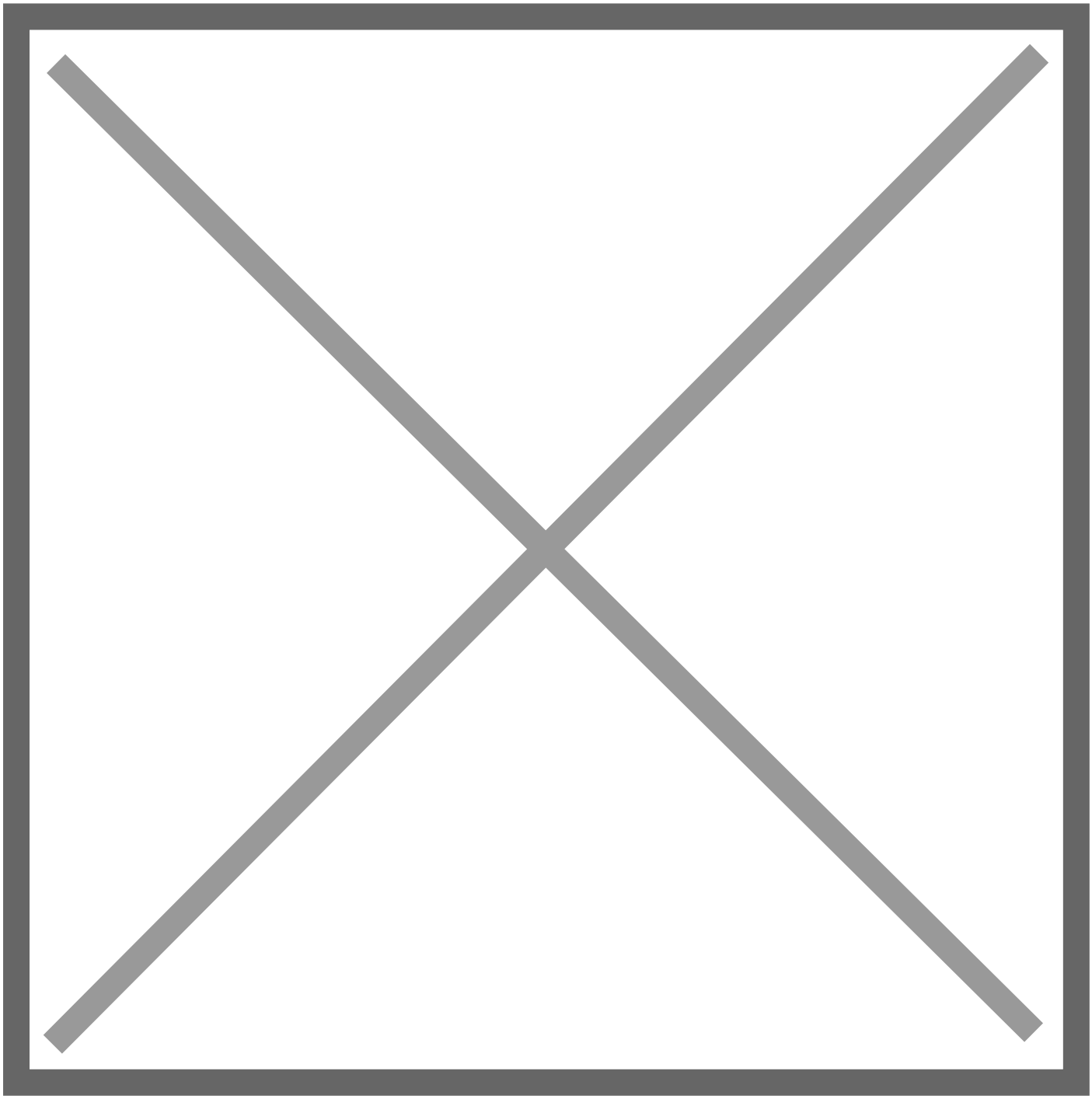


Toyota’s light-duty FCEV, the Toyota Mirai, has been on sale in California since 2015 and is currently in its second generation. First unveiled in 2014, the Mirai was released for sale Oct. 21, 2015, the same day traveled to by the fusion-powered car in “Back to the Future II.”

With emerging technologies like fuel cell electric and its hydrogen fueling infrastructure still taking hold, second-generation Toyota Mirai customers are provided up to $15,000 or six years’ worth of complimentary fuel for purchases. Owners can also receive up to $15,000 or three years’ worth of complimentary fuel for leases. This benefit gives customers the opportunity to get used to a new fuel type while also helping them as the

hydrogen fuel market continues to develop.

Move Aside Diesel, Hydrogen Already Powers Big Rigs Around the World



It might be surprising to hear, but fuel cell electric technology is also becoming increasingly used in semitrucks. In Europe, it was actually reported that fuel cell electric technology can deliver better fuel economy than a diesel engine.

Toyota is making strides in helping propel hydrogen-powered heavy-duty trucks, too. Through a collaboration with Kenworth on the ZANZEFF “Shore to Store” project, Toyota developed a fuel cell electric powertrain for Kenworth’s T680, an 18-wheeler that can be loaded to 82,000 lbs. GCWR . In 2023, Toyota plans to begin production of fuel cell electric modules for commercial trucks, taking learnings from the collaborationist relationship with Kenworth and applying them on a mass scale.