“Uno” Looks to Provide Toyota with More Ways to Fight Carbon

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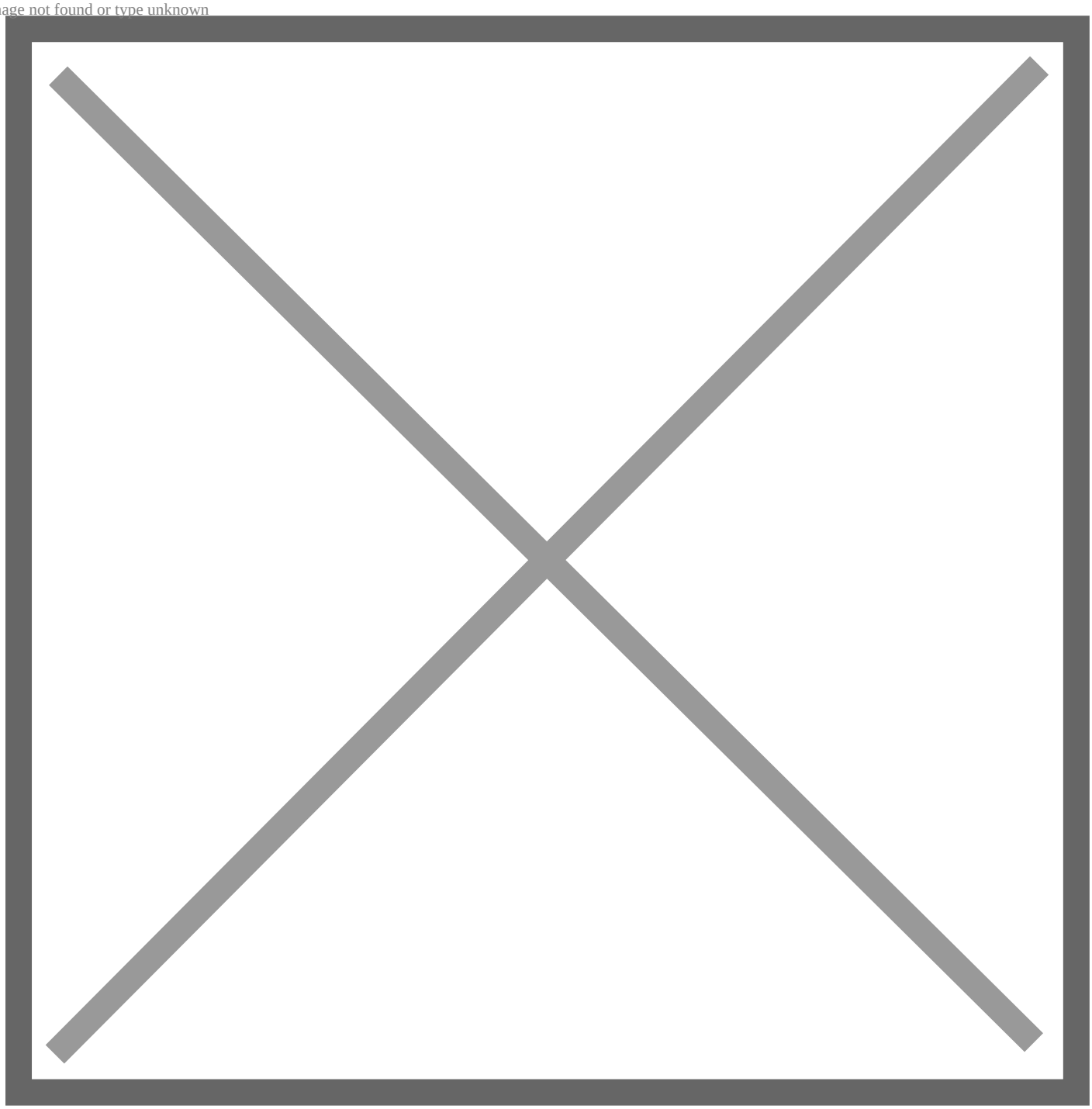
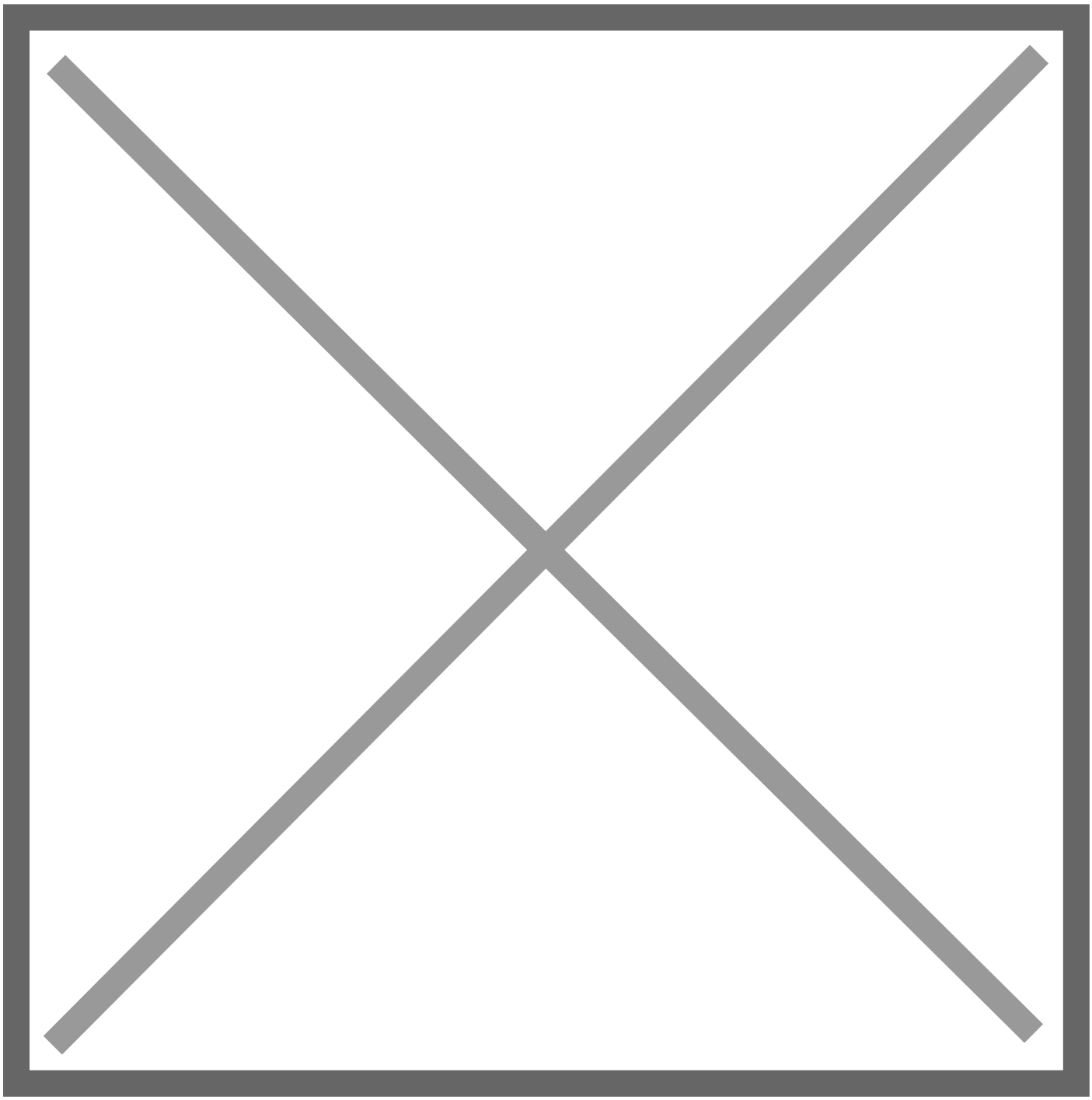


Utility tractor rigs (UTRs), sometimes called “yard dogs,” do some of the hardest work at shipping ports, moving freight from one part of the yard to the other. The trucks help prep cargo for loading onto trains or drayage trucks, or they often bring cargo that comes in from rail or trucks to ocean freighters. It is energy-intensive, stop-and-go work, sometimes pulling loads of 120,000 pounds or more.

UTRs may look smaller than the heavy-duty rigs you see on highways, but they are still very tough. They must be to get the job done. Today, almost every UTR, like most other trucks operating in and around ports, runs on a diesel-fueled internal combustion engine. Toyota decided to buck the trend and build a fuel-cell electric UTR. The vehicle’s nickname is “Uno” because it’s the first of its kind, but it likely won’t be the last.

Diesel is cost-effective and proven fuel for these applications, but it is a carbon-intensive form of energy. With an estimated 12,000 trucks operating in the Port of Los Angeles complex, that’s a lot of carbon emissions. In fact, cargo-handling equipment at the Port of Los Angeles, including yard trucks, were reported to have produced 185,000 metric tons of carbon dioxide in 2021, according to the port’s carbon emissions inventory. But it won’t stay that way.



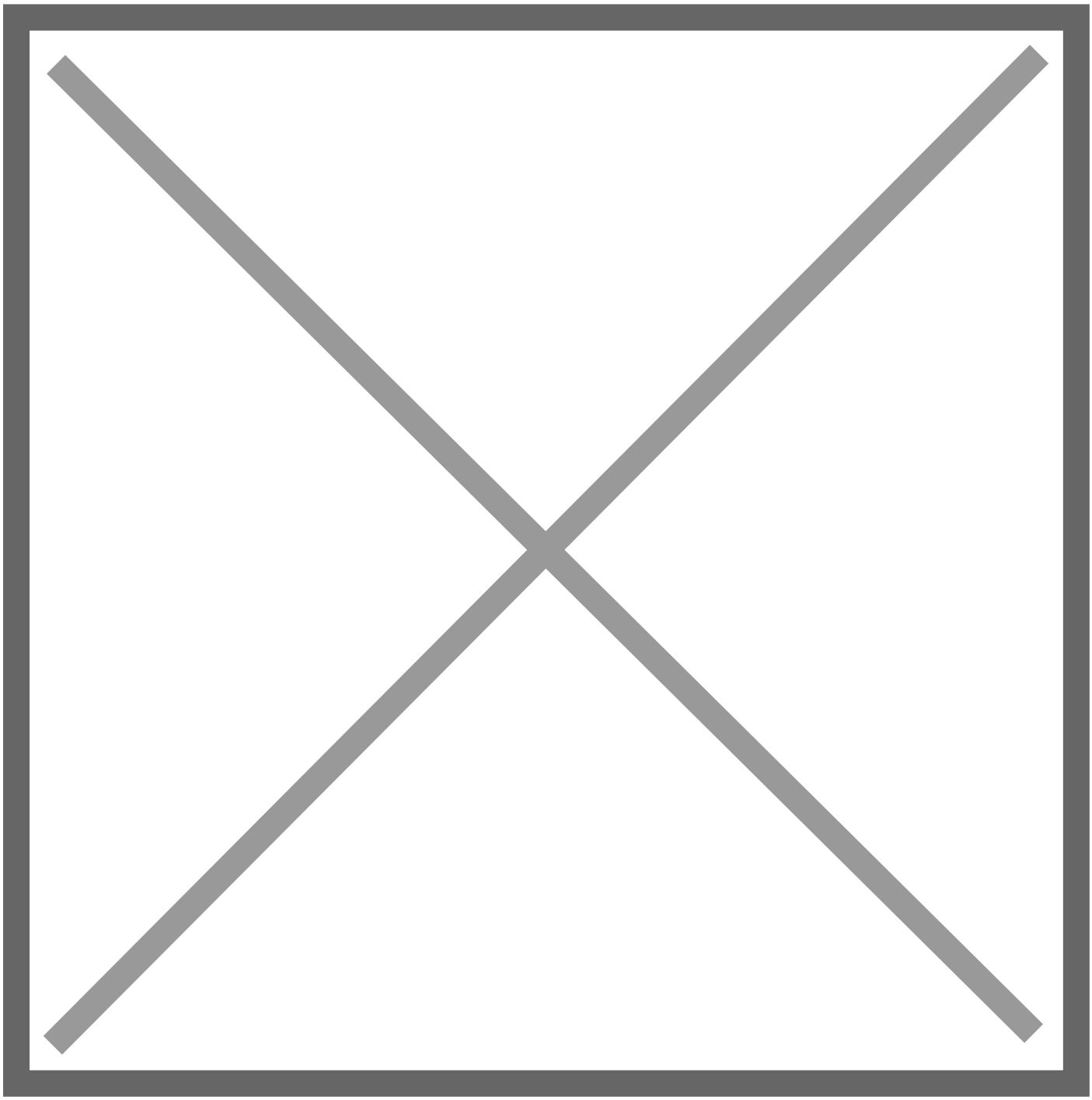
The Port of Los Angeles has become a hotbed of pilot projects targeting a reduction in carbon emissions; in 2022, it was the site of 16 different pilot projects where hundreds of zero-emission vehicles were being tested. The tests aim to identify how to achieve zero emissions for the port by 2035 as part of the Clean Air Action Plan. Of the various solutions being evaluated, which include things like battery-powered electric trucks, one powertrain stands out from the rest: hydrogen-powered fuel cell electric trucks.

Toyota has been in the news for tests like the class 8 heavy-duty fuel cell electric T680 developed in collaboration with Kenworth last year. “Uno,” a first-of-its-kind hydrogen-powered fuel-cell-electric UTR, has

gotten far less attention but is arguably no less important. Uno was developed by Toyota engineers and in collaboration with Fenix Marine Services. It was first deployed at the Fenix terminal at the Port of Los Angeles in 2019. The deployment was to test how zero-emission container-handling equipment could operate in a real-world, marine terminal environment.

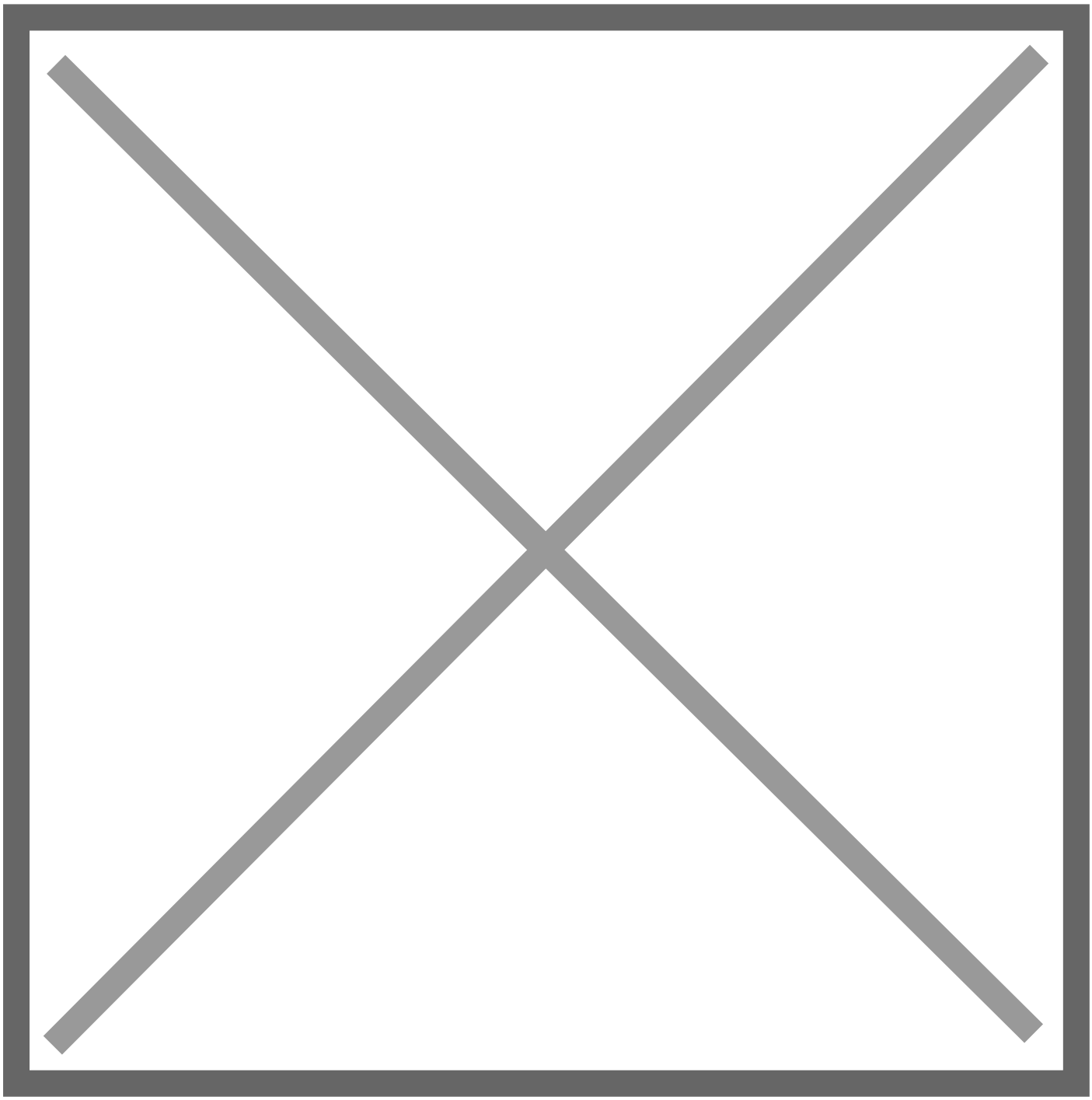
Fenix's terminal handles over one million containers per year, and the hydrogen-powered yard dog was deployed as a test to demonstrate its capabilities in helping the Port to meet its Clean Air Action Plan goals. Uno stepped into the role and met the challenge, all without emitting any carbon emissions. Uno is powered by the same modular fuel cell foundation as Toyota's zero-emission, fuel cell electric passenger car, Mirai. With hydrogen as its fuel, the powertrain allowed for quicker refueling time than battery-electric options in the same space.

Although vehicle technology is something Toyota is very familiar with, this demonstration took the company out of its comfort zone of selling directly to consumers. With Uno and other similar opportunities, Toyota is operating in business-to-business market. Here, Toyota acted as a powertrain supplier instead of assembling a finished vehicle. However, this project reflected the company's thinking about how it may work in the future, especially in the heavy-duty transportation sector.



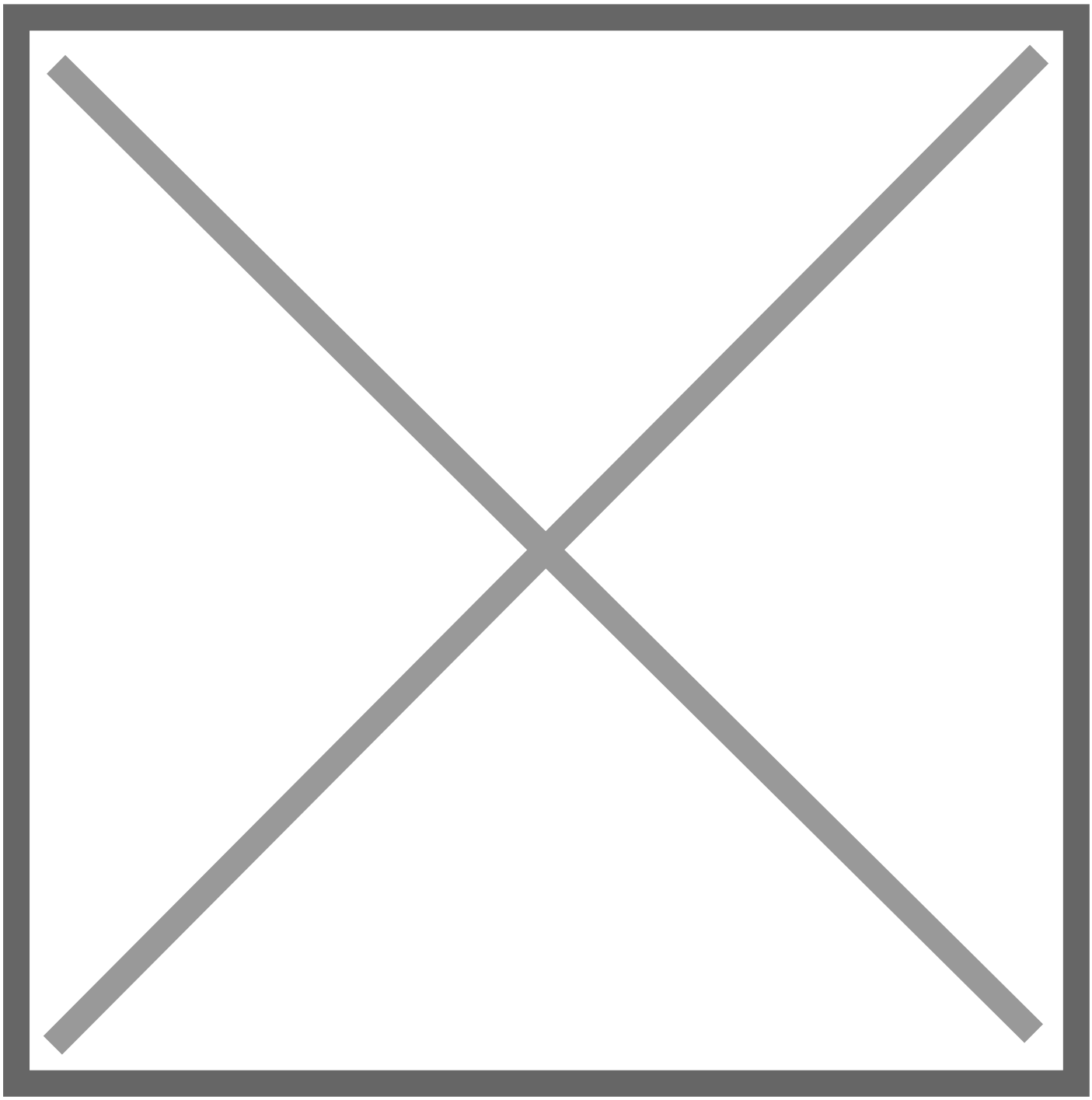
“To pursue opportunities to convert elements of the trucking industry, ocean ships, commercial buses or even station power to hydrogen, Toyota will need to play a different role,” says Kohei Masaki, a hydrogen strategy consultant with Toyota in Gardena, Calif.

Indeed, as Toyota looks at the hydrogen economy of the future, it may act as a Tier 1 supplier of hydrogen-powered fuel cell electric powertrains to other manufacturers. The company plans to supply the elements needed, including fuel cell stacks, hydrogen tanks, and other needed software and hardware. The commercial vehicles themselves, however, will likely be designed and developed by other companies.



The work on UTRs won’t stop with Uno. Toyota’s engineers are working on new, improved fuel cell electric powertrains to increase the amount of operating time and make them more efficient.

“The results of these improvements will be a much more capable version of the hydrogen-powered UTR, bringing it closer to matching, or in some cases even exceeding, the performance of the carbon-intensive powertrains it will eventually replace,” said Dallas Fox, a Toyota engineer working with partners on potential fuel-cell applications.



Even though Uno’s initial job as a proof-of-concept truck at the port may have finished last year, it hasn’t been retired just yet. Toyota saw another chance to use the vehicle in its own operations. The truck was moved from the port to the company’s Los Angeles Parts Distribution Center (LAPDC) in Torrance, Calif., where it is enjoying its second life moving freight there in a much different work situation than the harried port. In its new job, Uno is continuing to provide lessons to Toyota’s engineers about the hydrogen economy, as they now study how it operates with lighter loads in a less stressful environment.

“Toyota LAPDC was excited, honored and privileged to pilot a hydrogen-powered UTR fuel cell truck for our facility,” said Ian Medina, LAPDC Logistics Leader. “The team immediately recognized the benefits of implementing ‘Uno’ in the day-to-day yard operations. Compared to a class 8 diesel tractor, Uno offers a reliable, safe, efficient, and easy-to-maneuver truck that helps reduce emissions. Based on the positive impact Uno provided LAPDC, we hope that the technology paves way for more opportunity to reduce our carbon footprint at ports.”

And Toyota is still looking for ways to implement the technology.

“It is challenging to do everything yourself – it takes a lot of time,” Masaki said. “We need to be faster, and we need more friends for this zero-emission technology to spread throughout the world, helping to reduce or eliminate emissions from this carbon intensive side of transport and logistics.”

Looking to the future, the Toyota Fuel Cell Development (FCD) team is exploring how its key learnings can be applied for a next-gen hydrogen-powered yard-dog truck, another avenue for Toyota to fight carbon in the future. Later this year, Toyota will begin making its fuel-cell kit for heavy-duty over-the-road big-rig trucks in Georgetown, Kentucky. Along the way, Toyota’s FCD team will continue to look for opportunities to partner with other companies in building the new hydrogen economy.

– Story by Jeff Plungis

For information about Toyota’s fuel cell electric efforts, please contact Josh Burns.