Toyota’s Vehicle-to-Grid Program with Oncor Energy Demonstrates Benefits of Bidirectional BEV Charging

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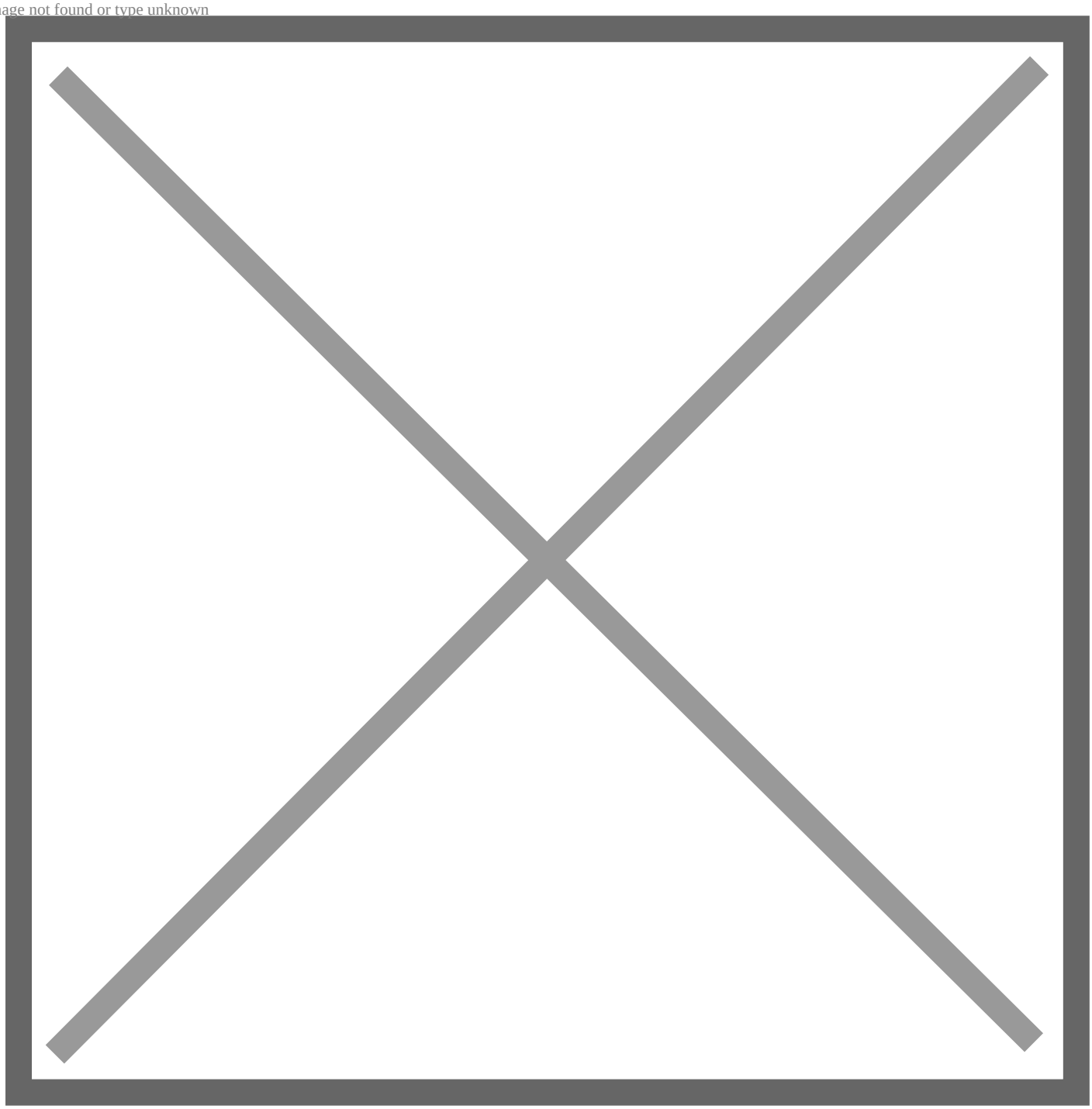
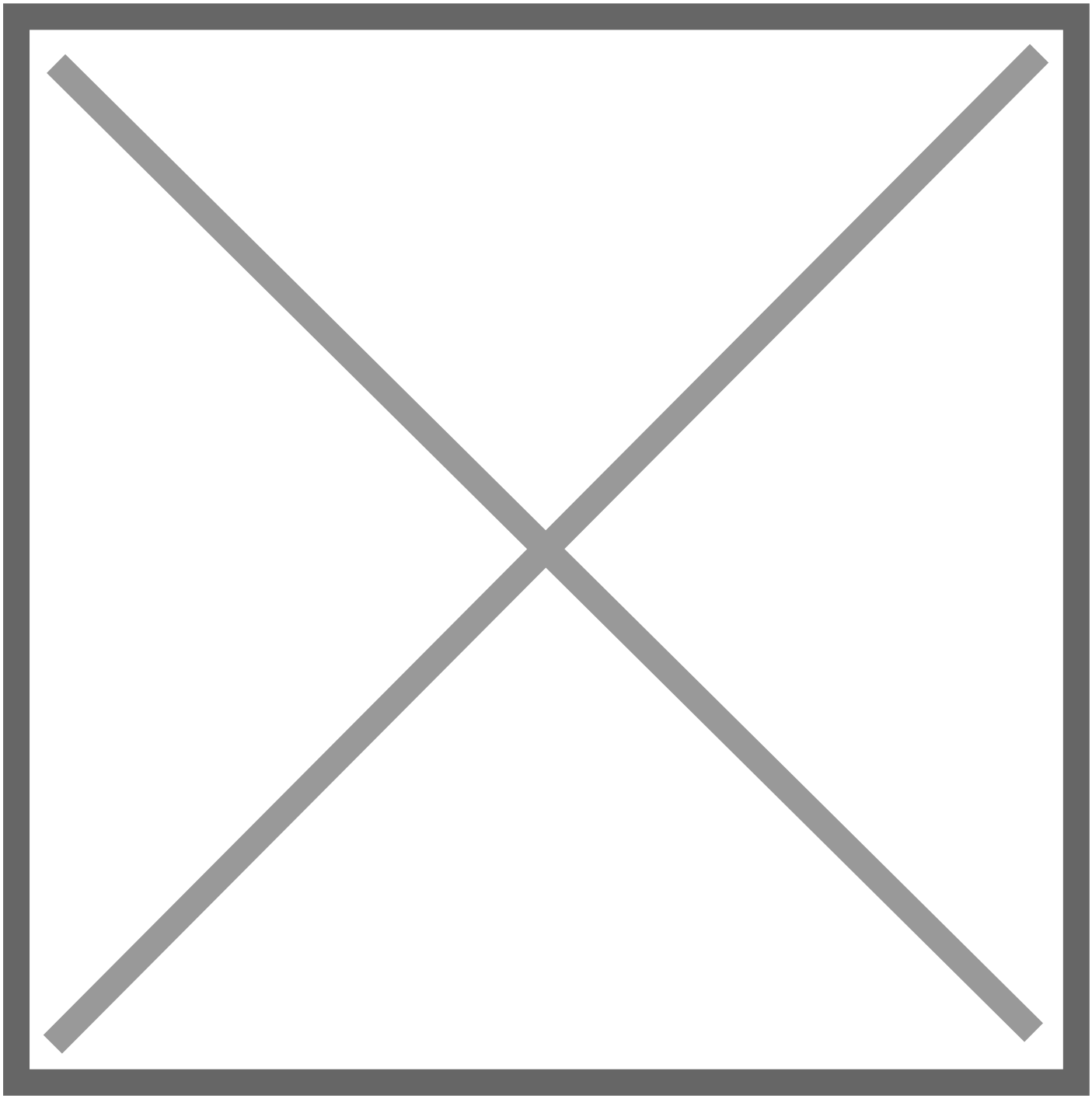


Battery Electric Vehicles (BEVs) have the ability to be so much more than just a means of transportation. They provide the potential to offer drivers more affordable vehicle charging and home energy costs. BEVs can also enhance electric grid stability and strengthen resilience.

In conjunction with Texas-based Oncor, one of the nation's largest utilities, Toyota has now introduced the next phase of its vehicle-to-grid (V2G) pilot. This program is designed to demonstrate real-world value by using bidirectional energy flow to enhance customer experience and create a more sustainable infrastructure that has the potential to lessen stress on the grid if scaled up.

"At Toyota, we are deeply committed to advancing technologies that enhance the everyday lives of our customers," said Christopher Yang, senior vice president of Enterprise Strategy & Solutions at Toyota Motor North America (TMNA). "V2G technology represents a transformative step in delivering an exceptional home charging experience. It can enable drivers to reduce their electricity costs and help contribute toward a cleaner, more sustainable energy future."

Yang continued: "For utilities, V2G can help smooth out spikes in demand and limit outages. It can help power homes when electricity is needed most and potentially serve as a virtual power plant, helping customers manage not only when they get their electricity, but from where."



Toyota’s Japanese-specification bZ4X serves as the test vehicle for its V2G pilot program at TMNA HQ.

Kicked off in late 2022, the first phase of the pilot focused on leveraging testing vehicle and technology capabilities by integrating a Toyota bZ4X prototype vehicle and Oncor’s microgrid at its test facility in South Dallas to better understand the interconnectivity between BEVs and the grid.

This latest phase of the pilot is currently taking place at Toyota’s Plano HQ to study the following:

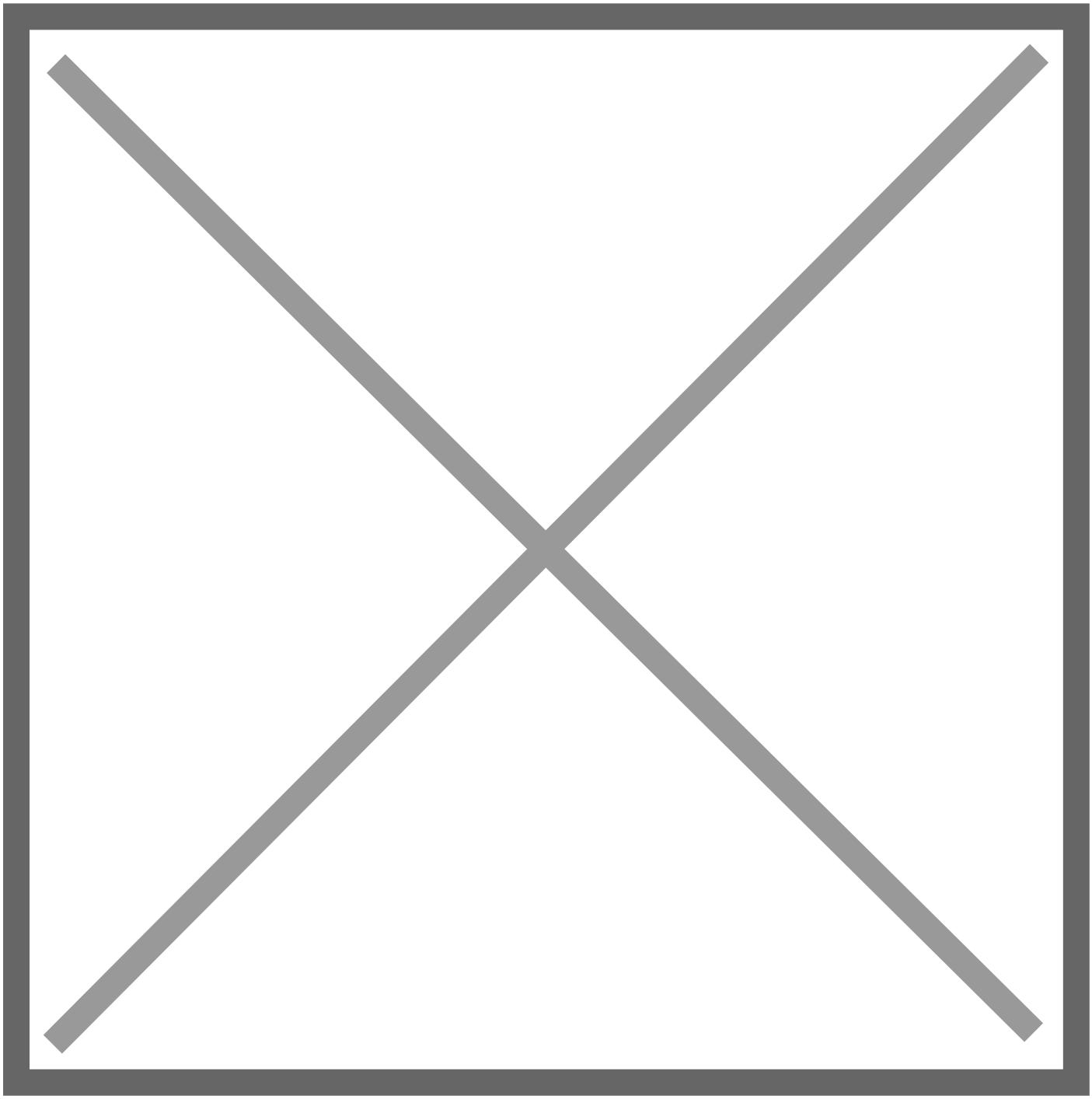
- Enhancing Grid Stability: By enabling BEVs to supply power during peak demand periods, V2G can act like a network of “virtual” power plants, helping to stabilize the grid during extreme weather conditions.
- Providing Backup Power: BEV batteries, such as the pack in the Toyota bZ, can provide backup electricity for homes during outages.
- Offering Cost Savings: In regions with variable electricity pricing, customers can charge their vehicles during off-peak hours and use stored energy during peak times, potentially reducing overall electricity costs.
- Improving Infrastructure Longevity: By easing strain on power lines and transformers, V2G can help extend the life of grid infrastructure and potentially reduce costs passed on to consumers.

Further, based on day-ahead market pricing, it may even be possible for customers to “sell back” energy to utilities, reducing monthly out-of-pocket costs.

How It Works

Wrapped in a distinctive blue “V2G” design, Toyota’s Japanese-spec bZ4X is connected to a Fermata Energy EV charger. This charger, managed by Fermata’s cloud-based V2G optimization platform, enables bidirectional energy flow by analyzing price signals and grid conditions to determine the optimal times to charge the vehicle and discharge stored energy back to the grid.

Currently, more than 4 million battery electric vehicles are on U.S. roads. If all were equipped with bidirectional charging, they could collectively contribute approximately 40,000 megawatts to the grid – a power output similar to that of 40 nuclear power reactors.



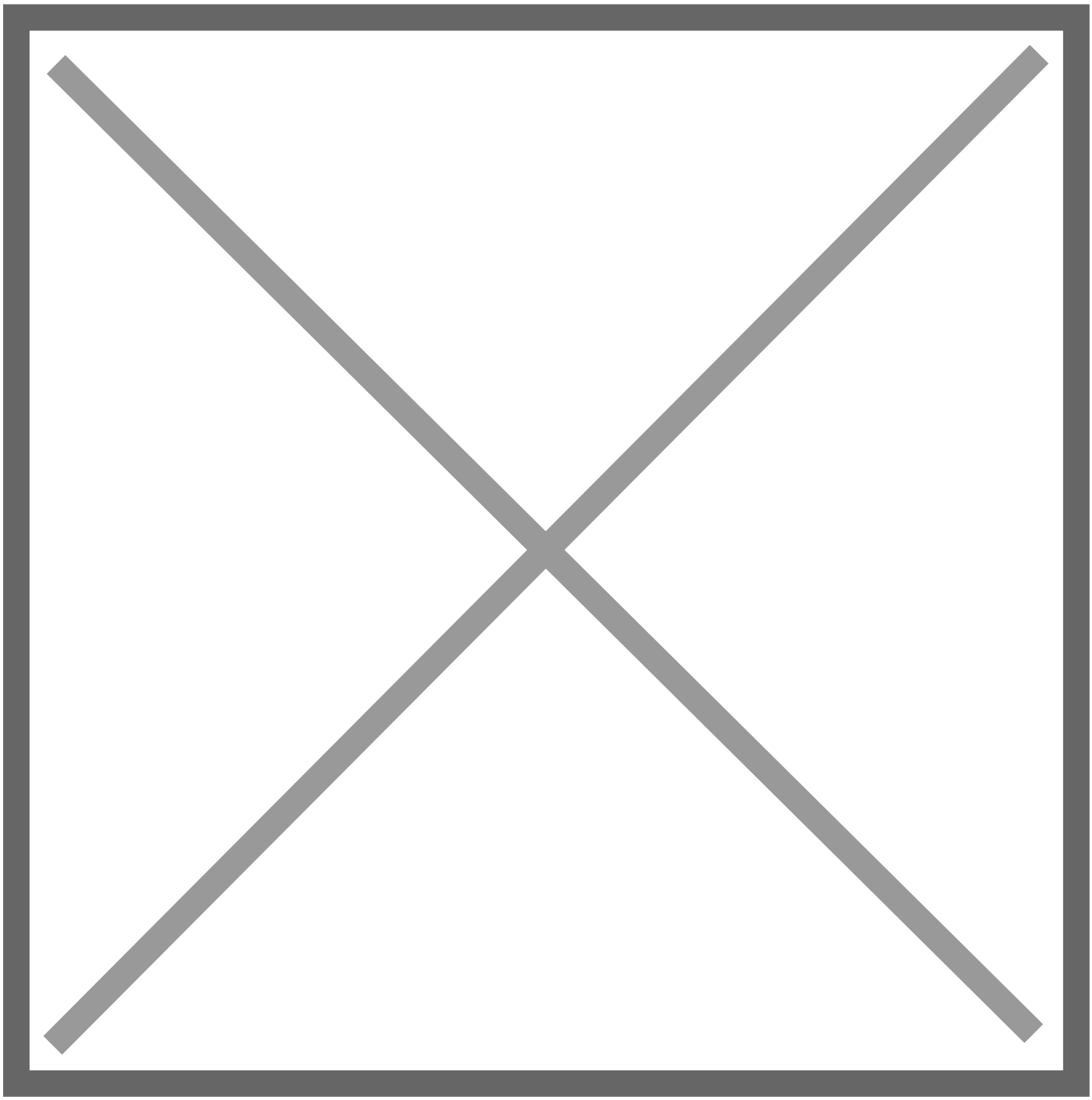
Toyota team members from Enterprise Strategy & Solutions celebrated the grand launch of the V2G pilot. L to R: Kellie Alexander, Anne Wu, Chris Yang, Maddy Strutner, Joy Baskin, Thibaut de Barros Conti, Martin Tran and Chris Moon.

Collaborative Pilots and Future Outlook

Toyota is actively testing V2G technology through pilot projects with other utilities including San Diego Gas & Electric and Pepco in Maryland. These pilots aim to help Toyota and the utilities understand diverse customer

needs and infrastructure requirements across different markets.

“Integrating vehicles into the grid presents a huge opportunity to increase renewable penetration to the grid and make energy more affordable. Utilities are a key stakeholder in this transformation, and Toyota appreciates the learnings generated from these V2G pilots,” said Maddy Strutner, Manager of Grid Services at TMNA.



Representatives from Toyota, Oncor and Nuvve/Fermata celebrated the opening of Toyota's V2G pilot TMNA HQ. L to R: Chris Yang, Geoff Bailey (Oncor), Ellen Buck (Oncor), Hamza Lemsaddek (Fermata) and Thibaut de Barros Conti.

Driving Innovation Forward

Toyota is working to develop the necessary technologies and business models to enable seamless V2G integration.

"This pilot is a critical step in exploring how connected vehicles can transform the broader energy ecosystem, delivering value to customers, the grid, and communities," Yang said. "By enabling bidirectional charging, we're exploring how we can help customers potentially save money while also reducing carbon emissions from the grid – a win-win for drivers and the environment."