Collaborations Show There’s More to Electrification Than BEVs

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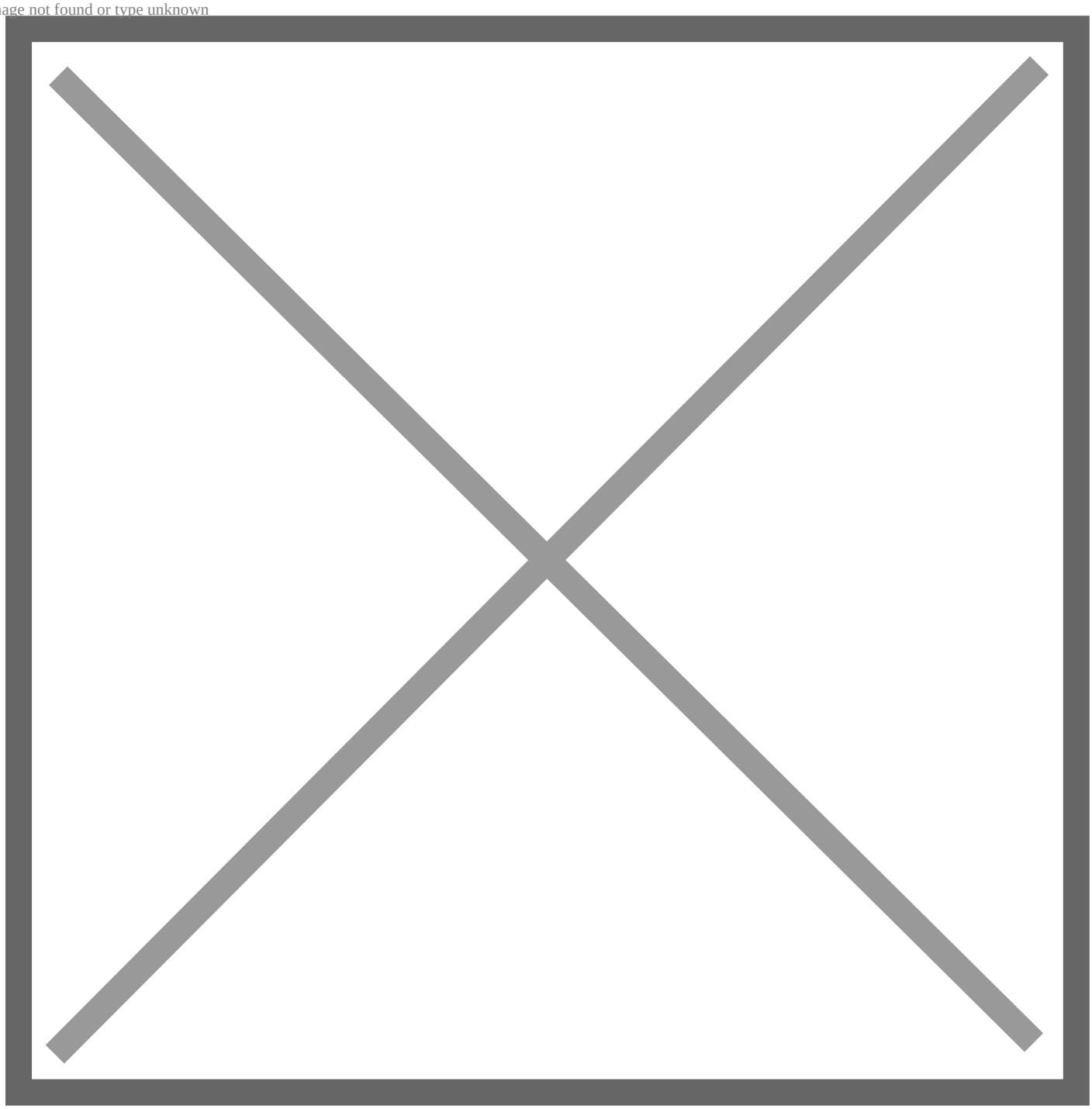

Collaborations Show There’s More to Electrification Than BEVs

It’s common knowledge that the automotive industry is in the midst of a fundamental transition from producing and promoting vehicles powered by internal combustion engines to those propelled by electricity. The wave upon wave of new battery-electric vehicles (BEVs), such as the Toyota bZ4X, serve as high-profile proof of this sea change. But, the fact is, there’s a lot more going on here just under the surface.

Case in point: Toyota Motor North America’s (TMNA) formation of the EV Charging Solutions. Led by General Manager James George, its mandate is to help create a mobility ecosystem that will make owning and operating a BEV as seamless for Toyota’s customers as they’ve come to expect with conventional vehicles.

But there are others. Recently, we had the opportunity to chat with Max Parness, senior manager of Grid Services, to learn more.

One Toyota: Thanks, Max, for the chance to catch up on the latest with EV Charging Solutions.

Parness: We’re grateful for the opportunity to talk about some of the projects we’ve been working on now that we’re able to share them publicly.

Perhaps we could start with a bit of background on you and your role at Toyota.

My area of focus is grid services, in particular the growing nexus between mobility and the electrical grid. I’ve been interested in this since I first worked on it in grad school 14 years ago, after earning an undergraduate degree in electrical engineering

Sounds like really good timing for you, and for Toyota.

It’s definitely gratifying to have a part to play in taking concepts that have been explored and debated for a while and begin to implement them in the real world.

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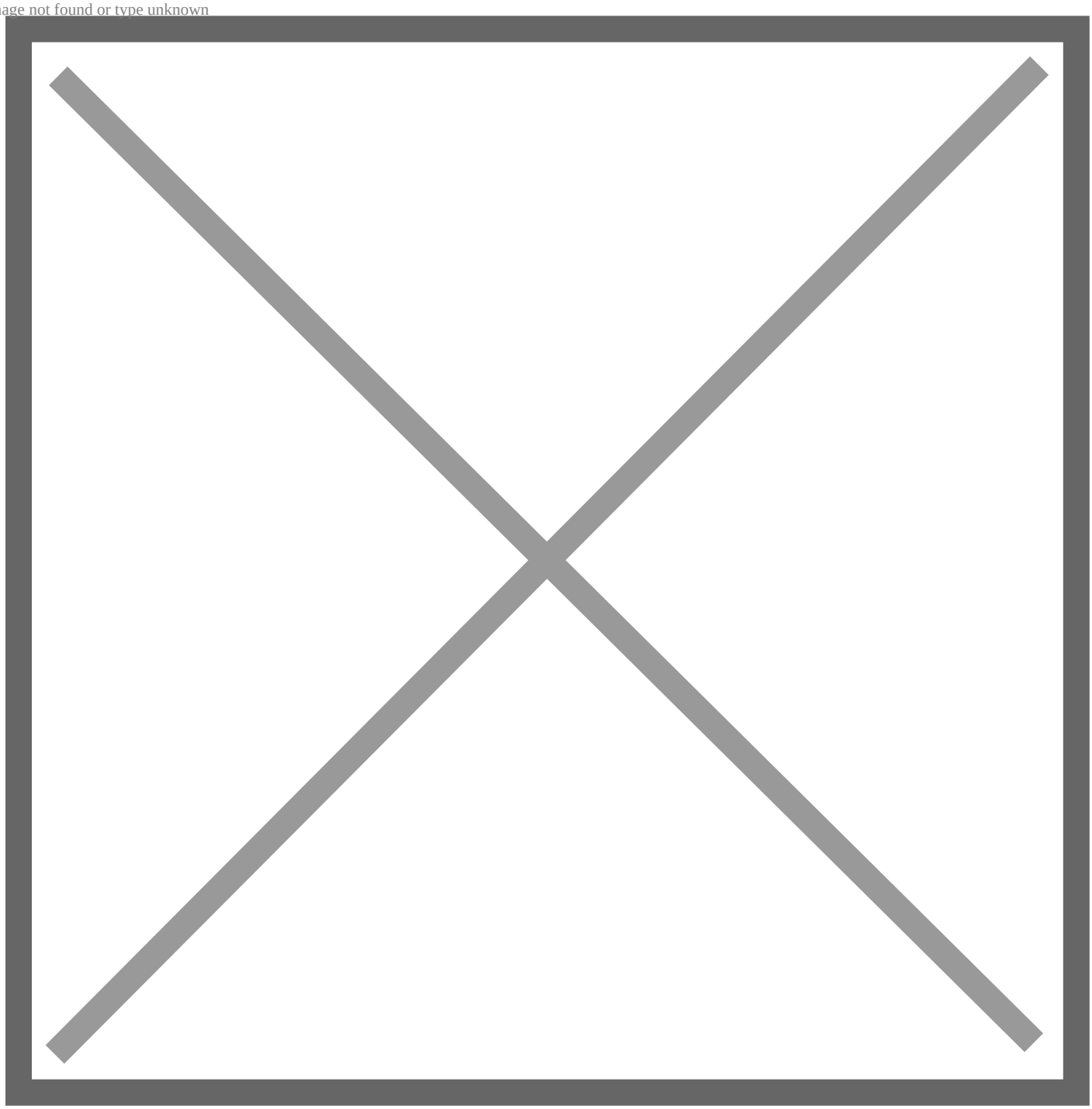


Partners in Power — *TMNA, with the support of Oncor Electric Delivery, is exploring the feasibility of feeding electricity stored in a BEV battery, such as that in the bZ4X, back onto the grid.*

For example, TMNA's recently announced collaboration with Oncor Electric Delivery, the largest electric transmission and distribution company in Texas?

Yes. I have been directly involved in that project.

Why is it important?

Every time we sell a BEV or Plug-in Hybrid Electric Vehicle (PHEV), that customer is getting some or all of their energy for driving from their electric utility. As a result, we have a mutual customer with utilities. We need to figure out how to work well together to support that mutual customer.

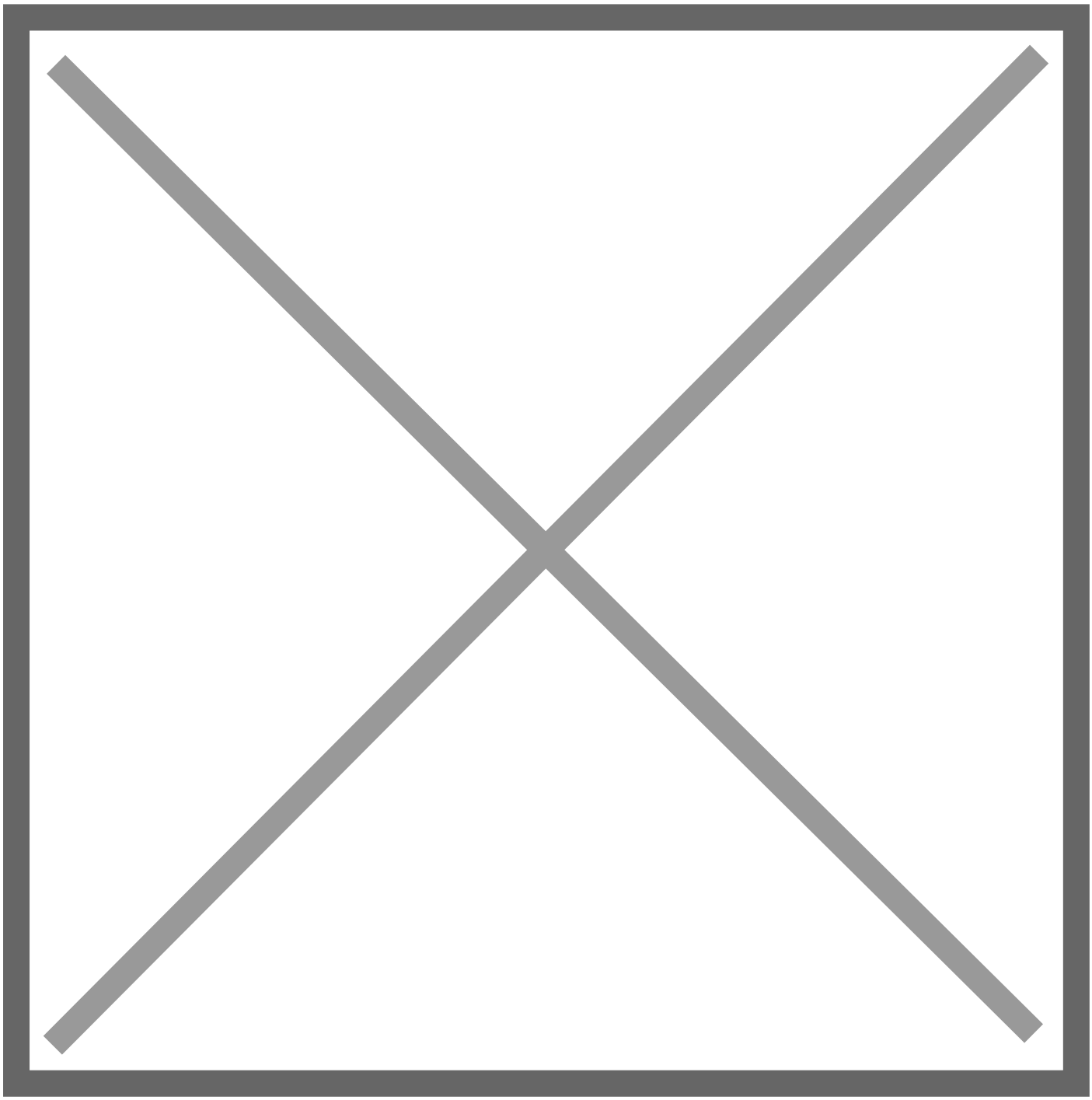
Utilities are simultaneously excited and concerned about EVs. They are excited about being able to sell more electricity and are concerned about how to integrate the coming millions of EVs into the grid in a cost-effective and reliable way. Toyota is well positioned to help utilities, due to our competitive advantages in marketing and customer trust, as well as our technological ability to empower customers to choose the best times to charge.

Our collaboration with Oncor is the first time Toyota has worked directly with a utility on BEVs. In this case, we are exploring how we can use the battery in a vehicle for both energy and mobility.

For instance, BEV owners could push some of the energy stored in their vehicles' batteries back onto the grid to support it when it's stressed. That would be a win for the customer, giving them a way to sell their power back to the grid. It would be a win for the utility to better manage surges in demand, such as during heat waves. And it would be a win for Toyota by creating a new revenue stream by facilitating this connection.

How soon might something like this be operational?

It's too early to say. For now, we have committed to a two-phase research project. In the first phase, we'll look to hook up a bZ4X to Oncor's research and testing microgrid in South Dallas to better understand the key interconnectivity issues. Then in the second phase, planned for later this year, we will test the connection of BEVs parked at a home or business locations within Oncor's service territory.



Ask the App — *When should you recharge your BEV to help minimize carbon emissions generated by the production of electricity? WattTime data, now integrated into the Toyota and Lexus apps (with a Remote Connect subscription), can help answer that question.*

We also noticed the announcement in January about an agreement with WattTime.

WattTime is an environmental nonprofit that provides data on times when the emissions from the local electric grid are expected to be lower. That can help to minimize the overall carbon footprint associated with all kinds of

electricity usage, including EV charging. WattTime's data has now been integrated into the Toyota and Lexus apps that are available to our customers who subscribe to the Remote Connect service. The feature is called ECO Charge. So, for example, a bZ4X owner could use this ECO Charging feature of our app to decide when to recharge their vehicle in a more environmentally conscious way.

We're guessing this will most likely appeal to our most environmentally aware customers.

Yes, but I think the sensitivity to these issues is now more mainstream — especially among people who are ready to trade in their internal combustion engine vehicle for a BEV. To that end, Toyota is currently the only automaker to have access to WattTime's data related to human health. There is an equity angle to this for people who live near coal- or gas-powered power plants. If BEV owners are more likely to recharge their vehicles when renewably sourced electricity is on the grid, then people who live adjacent to coal or natural gas plants may potentially benefit from cleaner air. At least that is the hope. Furthermore, this kind of program will help us learn more about customer behavior when it comes to EV charging. Those learnings will help us improve our future product offerings.

Knowledge is power, as they say. It seems like that dynamic is at the heart of the Oncor and WattTime collaborations.

That's how we see it. We also see that this as just the beginning. Consider this: By 2030, the power demand, or even supply, from EVs will be equivalent to that of tens of nuclear power plants. We are a mobility company selling cars, who will happen to have some influence over a massive "virtual" set of power plants. During a heat wave or an ice storm, Toyota can help encourage, or even actively manage, the time when customers are charging their vehicles to relieve stress on the grid. That's called "managed charging" and it will help customers spend less money to charge at home, support grid reliability and reduce emissions. It's all part of a transformation to ensure a best-in-class electrified customer experience. Expanding into this area and developing new external partnerships will be a big growth area for the company, powered by continued strong collaboration between internal teams, including Connected Technologies and marketing.

Then we will continue to follow the work of EV Charging Solutions closely and check in with you and your colleagues periodically. Exciting times.

They are indeed. Happy to help.