

# Three V2G/V2X projects getting around major challenges of consumer vehicle space

**V2G** | Electric vehicles are batteries on wheels, and often with quite large batteries too. Bidirectional charging means vehicle-to-grid and vehicle-to-building are technologically feasible, but barriers to adoption include manufacturer warranties and customer acquisition. Cameron Murray meets three companies taking a practical approach to scaling their V2X propositions.

Vehicle-to-grid (V2G) or vehicle-to-everything (V2X) technology has the potential to massively boost the amount of flexible capacity on the grid or behind-the-meter, considering the number of EVs set to arrive on roads in the coming years. The 623,000 EVs sold in the US in 2021 equates to at least 25GWh of potential energy storage, based on an average battery size of 40kWh (which is growing).

But major challenges to scaling up the technology, which combines EV batteries, bidirectional charging and smart software, exist in the consumer vehicle space. In this article, we interview three companies launching V2G/V2X projects in the US and Canada that provide alternative use cases not beset by those challenges.

## SWTCH: 'EV charging with added value'

Canada-based SWTCH provides bespoke EV charging infrastructure solutions in the consumer space, including V2G technology, but CEO Carter Li is sceptical of how far the technology can be used on a daily basis.

"It's not every day that a user thinks 'I want to discharge my energy today'. End-users' main focus is on charging their vehicle and might participate in V2G if there is a way to make money off that once in a while, so we offer EV charging with the potential for revenue and value-adds rather than a straight V2G service. End-users worry about how much their range will be reduced by daily participation," he tells PV Tech Power.

SWTCH recently partnered with condo developer Tridel and e-bike and EV car share company Kite Mobility to install Canada's first multi-residential V2G EV



Image: Highland Electric Fleets.

Highland provides turnkey bus electrification with V2G wrapped into the service.

charger at a residential block in Toronto.

The pilot will allow the building to draw energy from EVs during demand response programmes which Li says occur in the order of 5-20 times a year, and will allow SWTCH to get around one of the main challenges with consumer EV V2G/X.

Li explains: "The project answers the challenge of making sure that the vehicles are actually plugged in when they're needed. If the building operator violates the demand response contract with the utility, they get a massive fine."

"We're using shared mobility vehicles that people book with a reservation system. So we can make sure that the vehicle is not reservable in the period when the curtailment event is going to occur. So, it's an interesting example of creating a reliable use case in a setting where it is not normally reliable, because

they are end-consumers."

Li adds that backup power is another potential low-hanging fruit use case for V2G technology.

For now, he says that it only makes sense to discharge from a consumer EV during the sporadic demand response periods throughout the year: "The return of participating on a daily basis through peak shaving etc does not increase dramatically on top of those 5-20 most lucrative demand response periods in the year. And it also means you have to think more about battery degradation."

The move towards more frequent discharge events which are more lucrative than peak shaving, like frequency response and voltage regulation, would need more data points around how they affect battery life cycles, and perhaps an improvement in battery chemistry itself, he says.

### The Mobility House: 'Vehicle-to-building resiliency'

As discussed previously by *Energy-Storage.news*, buses are a great use case for V2G and V2X. A project in the city of Oakland in California, US, will see stored energy from AC Transit's electric buses provide backup power to the West Oakland Branch of the Oakland Public Library.

The California Energy Commission-funded project aims to demonstrate the value of bidirectional EV charging to create a 'vehicle-to-building (V2B) resilience hub'.

Germany-headquartered firm The Mobility House will provide its Charge-Pilot software to optimise the charge and discharge of the bus batteries when parked at the library and manage their powering of the building. The project will be up and running by mid-2023 and will run for two years.

Sarah Woogen, The Mobility House's Head of USA Operations & Analytics, tells PV Tech Power that the bus batteries will allow the library to act as a safe space for the Oakland community during public safety power shutoffs (PSPSs) and rolling blackouts, with a recently upgraded HVAC and air filtration system.

Extra use cases through V2G could happen too, even within the project's two-year timeline, Woogen added: "It could, depending on the timeline. V2G can be a little more complicated to set up initially because it requires additional permitting and interconnection, but all the hardware is there."

"The chargers are Rule 21 compliant which means they can export into California's grid under certain programmes being developed."

The Mobility House focuses on fleet vehicles like transit, school or commercial fleets. Woogen explains why these can be good use cases for V2X/V2G.

"You might have a lower barrier to entry because you don't have to sign up each individual vehicle. Within the fleet space, a lot is happening with school buses since a lot of them are already bidirectionally capable, as that was part of the requirements for certain funding schemes over the last few years."

"They also have large batteries and have a lot of downtime, notably during those peaks at 5 pm when all the kids are already back from school."

The Oakland project, on the other hand, uses public transit buses instead and while these are at an earlier stage of V2G/V2X adoption than school buses, Woogen

expects this to grow in the coming years.

"Public transit is not talked about as often but we're going to prove that out with projects like these. Though they run a lot more than school buses, they have enough dwell time that they could provide V2G/V2X. And their batteries are even larger, 1.5-2x bigger than school buses, so there are opportunities for these fleets to be making revenues this way," she adds.

### Highland Electric Fleets: 'Electric school buses as energy assets'

Massachusetts-based Highland Electric Fleets is one of those companies capitalising on school buses' unique potential for V2G/X. The firm offers school bus electrification solutions under an annual mileage payment, into which it wraps V2G functionality, for which it currently works with aggregation partners to manage.

"School bus lives are predictable and so can be used as energy assets for the grid really effectively," explains Sean Leach, the firm's director of technology and platform management.

"And the grid's need is highest in summer when the buses are doing nothing most of the time. We can have the bus participate in those grid programmes which then keeps the contract cost with the end-user as low as possible."

The main V2G use case of Highland's fleet of electric buses is to provide energy to the grid for peak events. This is where grid operators will specify in advance a specific time period of the day, which normally comes well after the school home run, in which it wants the firm to discharge the bus batteries.

The firm has had its electric buses active in commercial V2G for two years during which it has discharged around 10MWh back to the grid, Leach said. A project in Beverly, Massachusetts, with two Proterra Powered battery system-enabled school buses accounts for the bulk of this.

Those vehicles participated in 32 grid events over this past summer, providing power to grid operator National Grid, with the discharges typically requested 24 hours in advance.

Another project launched in August saw four new electric buses join the South Burlington (Vermont) school district which will provide power to utility Green Mountain Power (GMP).

Asked if the summertime period offered the potential to expand the variety of use cases beyond scheduled grid events, i.e., to value-stack, Leach says:



Image: SWTCH Energy

**SWTCH provides EV charging solutions with V2G as an optional value-add, but CEO Carter Li is sceptical of how far it can go in the consumer space.**

"We still tend to just react to those peak events. However, with Green Mountain Power we'll be able to react to much narrower window events, i.e., unexpected peaks. Sometimes you only get a 10- or 15-minute signal, and we can react to that."

"For the future, there's the potential for frequency regulation. While we're not participating in any of those markets yet, there will be an opportunity for that at some point. Resiliency is another thing that we're looking at, which could be using bus batteries in the event of a grid outage."

Interestingly, that is exactly the use case of The Mobility House's project covered in the previous section.

The main challenge and slowdown with getting these programmes rolled out is that utilities are still trying to figure out how to pay people for the power coming back to the grid, Leach said, adding: "But all of them recognise the value of these EVs as essentially giant mobile batteries that they can call on for support."

Discussing battery degradation from V2G/X and how that affects battery warranties, Leach says that OEMs are in general not too worried.

"As long as you stay inside the warranty's specific maximum throughput of a pack, be it driving or V2G/X, they're okay with it. The discharges required for V2G are not as strenuous as an actual drive with a bus full of kids on a hot day going up and down hills."

In October, Highland and the Montgomery County Public Schools district in Maryland announced a four-year deal for Highland to provide 326 electric buses, which will all be V2G-enabled and equate to 65MWh of energy storage. The company today has around 20MWh of energy storage capacity available through around 100 V2G-enabled buses on the road. ►