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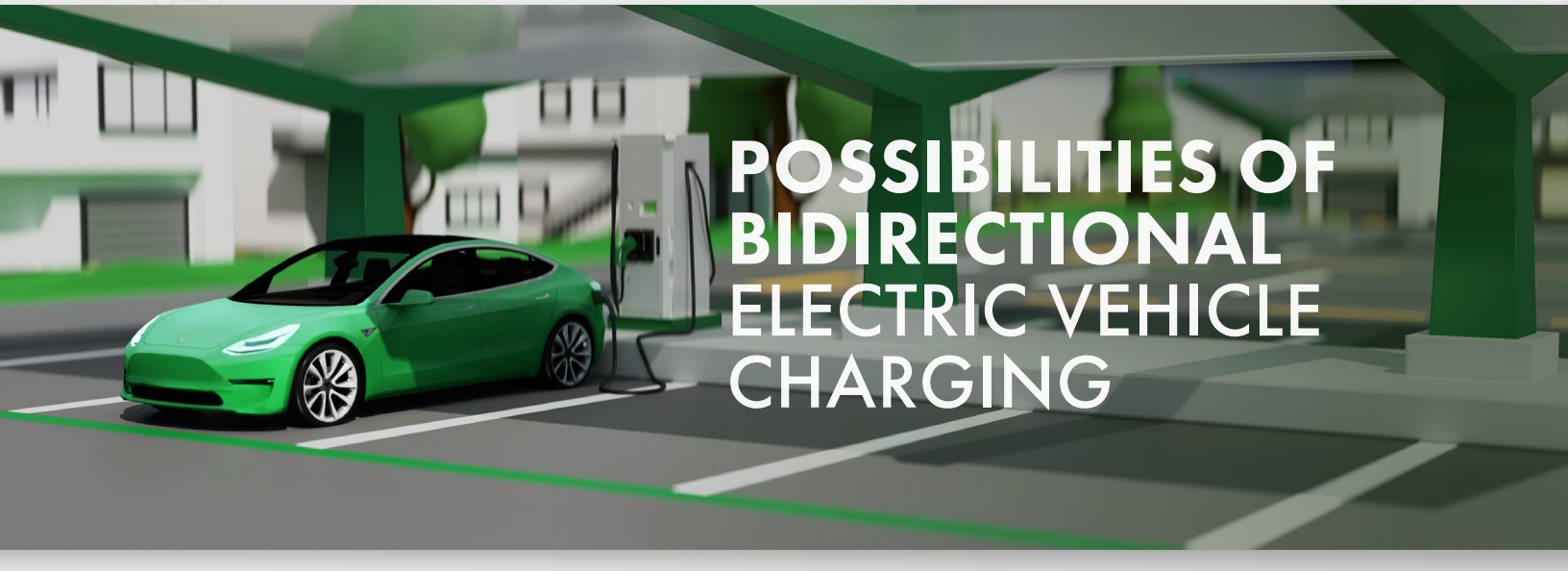

POSSIBILITIES OF BIDIRECTIONAL ELECTRIC VEHICLE CHARGING

As your Touchstone Energy® cooperative, we want to be your source for energy and information. Since electric vehicles (EVs) are becoming more mainstream, we put together a variety of fact sheets and information to help answer questions you might have.

Contact us for more information about EVs.

When we think of an electric vehicle (EV), we might envision a car charging up and then hitting the road, its battery depleting as it drives. Eventually, it will need to be plugged in to charge again. In other words, there is a one-way, downstream, relationship between the electric grid and EV: The car gets electricity from the grid so it can drive.

But what if the relationship could go both ways? What if, when plugged in and parked (which cars are most of the time), EVs could act as spare batteries, not only receiving power but also supplying it back to the grid, a home, a building or some other electrical load. This idea – known as bidirectional charging – is being implemented in pilot programs and real-life settings across the world.

The possibilities of bidirectional charging are vast. For example, EVs could be charged with solar energy during the day and then send power back to the grid later, when energy demand is high and solar sources unavailable. Or, if there's an outage, EV owners may be able to tap into their vehicles to provide backup power for their homes. Ultimately, bidirectional charging could help stabilize and complement the grid, defer the need for additional generation facilities and add value to EVs by giving them an additional use.

EV models are now being released with bidirectional charging functionality. The Nissan LEAF, Ford F-150 Lightning, Hyundai Ioniq 5 and Kia EV6 all come with the ability to transfer power from their battery packs. Many of these automakers are also participating in studies to further understand the opportunities afforded

by the technology. Ford, for example, is partnering with Duke Energy in Florida on an investigation that will use F-150 Lightnings, General Motors is conducting a pilot project with Pacific Gas & Electric in California, and Nissan has been exploring bidirectional charging across the globe.

Electric school buses in particular – as well as other medium- and heavy-duty vehicles – are being eyed for their bidirectional charging potential because of their often-predictable schedules and large batteries. Nationwide, many pilot programs evaluating bidirectional charging with electric school buses are already underway, and many school bus manufacturers have constructed their buses and charging stations with this use in mind.

Energy technology companies Nuvve and Fermata Energy are two other key players in this field. Nuvve has, for several years, been implementing bidirectional charging in Denmark. In one exploration with a local fleet, each vehicle earned approximately $2,000 in revenue for the power it supplied, and this revenue was used to provide other benefits for customers.

Fermata Energy and several clean energy organizations conducted a pilot project with Roanoke Electric Cooperative in North Carolina to quantify the value of bidirectional charging. The cooperative dispatched the battery of a Nissan LEAF parked at its headquarters to test three use cases: load following, peak load reduction, and backup generator support while the building was islanded from the grid. Roanoke Electric also demonstrated support for reduced system peak demand through a simulated response to demand reduction signals. The combined value streams generated by this deployment produced gross savings for the cooperative that exceeded the monthly lease cost of the LEAF.

The future of bidirectional charging is exciting, especially with the continued growth of EVs. The next few years should shed more light on these applications, and if they continue to progress, the grid might have a new tool to support its energy balancing act: a giant battery made up of thousands of EVs.

This article was provided by Advanced Energy, a nonprofit energy consulting firm. For more information, visit ***www.advancedenergy.org.***

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