



Welcome To The Rhombus Energy Solutions Newsletter!

Staying connected with customers can be a challenge today with the COVID-19 pandemic. That is why Rhombus Energy Solutions is kicking off our monthly newsletter! Our newsletter will be a mix of a variety of information on high-power charging and about the electric vehicle (EV) market. This will include news items about Rhombus and our products and technologies. We will also cover news items in the larger EV charging ecosystem, as well as news and advancements in the EV market, especially related to fleet EVs. We hope that you find our newsletter of value to you and your organization.

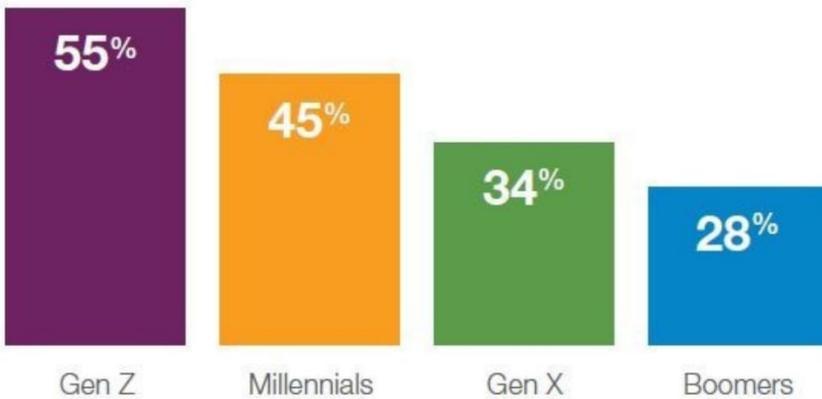


COVID-19, The Automotive Market, and Vehicle Electrification

If you have watched television at all over the past few months, you have seen lots of advertisements for new car sales. Nearly every auto company out there is providing significant incentives to get people into the showroom and out with a car. There has been a lot [written about the changes in attitudes](#), especially for younger drivers, towards car ownership. So how is this affecting the move towards vehicle electrification; i.e., will consumers and automobile manufacturers put money into vehicles that are often times more expensive than internal combustion engine vehicles, especially given the economic impact of COVID-19? Interestingly enough, most of the data and expert opinions point towards continued growth in EVs, and that COVID-19 may accelerate this.

A [recent article](#) in [T&D World](#) nicely summed up what many industry experts believe: "Electric Vehicle Market Will Keep Growing Despite COVID-19." Clearly, EV adoption has been growing exponentially over the past several years (though it is still a small percentage of

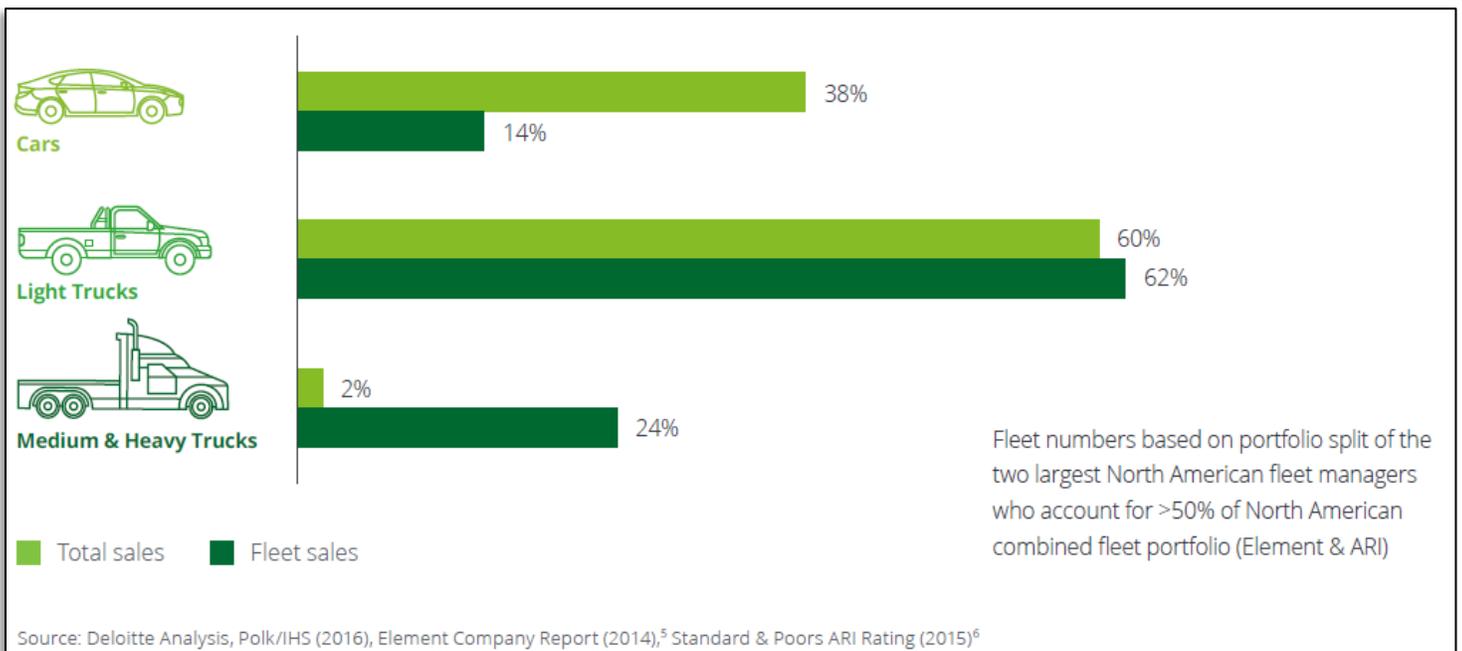
HAVING TRANSPORTATION IS NECESSARY, BUT OWNING A VEHICLE IS NOT (% AGREE)



Source: Cox Automotive

total vehicle sales), which provides momentum to this growth. A [recent article](#) in Automotive World highlighted the impact of EVs on ICE vehicles by illustrating significant drops in internal combustion engine production, with 2019 being 5% down from 2018. But beyond that, longer-term trends such as the continuing decline in the cost of batteries for EVs and government policies to cut greenhouse gas emissions clearly favor EVs over internal combustion engine (ICE) vehicles. For vehicle fleets, the addition of lower long-term operating and maintenance costs,

especially if the fleets can take advantage of vehicle-to-grid (V2G) charging, can more than offset the higher capital outlay for the vehicle. As fleet EVs grow as a [total percentage of all vehicles](#) (see below), this trend can be expected to increase. After all, Amazon, Uber, and Lyft have to get their vehicles from somewhere, and they are all committed to EVs. If you want to find out more on this topic, check out [our blogs](#) from April of this year.



Understanding Vehicle To Grid (V2G) Charging

As we mentioned above, the topic of vehicle to grid (V2G) charging, and the related topics of vehicle to building (V2B) and vehicle to house (V2H), are hot topics today (we will call these technologies as a group “V2X”). All three technologies provide the opportunity to perform “peak shaving”, where the EV’s batteries provide power to the grid (or commercial building or home). For utility grid operators, peak shaving through V2G provides the opportunity to forestall the building of (and paying for) new power generation resources. For commercial building owners

and homeowners, V2X peak shaving provides the opportunity to avoid peak hours surcharges which are generally extremely costly.

For fleet operators, V2G and V2B are particularly interesting. A recent demo by [Lucid Motors](#) and [IoTecha Corporation](#) showed that a single EV could generate \$5,000 in annual energy savings through V2B (you can hear more about it [here](#) in a recent CharIn panel discussion). For a fleet with dozens of vehicles, the potential savings can obviously be very great. Other studies have shown that school districts can benefit from electrifying their school buses and utilizing V2X technologies (generally V2G or V2B) can significantly reduce the energy costs for school districts.

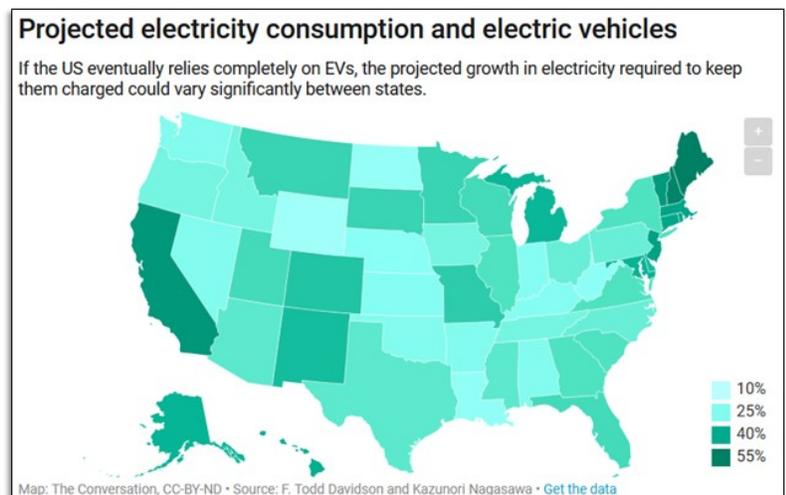
Of course, managing the injection of power onto the grid is not a simple matter – it requires significant management overhead and coordination with the utility providers. In the United States, the relevant standard is [Underwriters Laboratory Standard 9741](#). UL 9741 defines both the communications protocol between EVs with bi-directional chargers and the grid, as well as the test methodology for certifying a charger for V2G operation. Passing UL 9741 is not a simple matter – think about passing it as being an order of magnitude more difficult than passing unidirectional UL certification programs. As EVs become a greater percentage of fleet vehicles, expect that more fleet operators will require bi-directional capabilities in their chargers.

All Rhombus high-power chargers have been designed from the start for bi-directional, V2G operation, and we are working with all of the standards bodies to further V2G-capable high-power chargers, as well as educating charger operators on the right use case for V2G.

New Content from Rhombus Energy Solutions

One of the goals of Rhombus Energy Solutions is to provide thought leadership to our industry on a variety of topics. Some of the new content we have released is listed below, which you can access via the associated links and/or from our [website](#) or our [YouTube channel](#):

- [**“Combining Energy Storage With High-Power Chargers to Mitigate Grid Power Availability Issues for Electric Vehicle Fleets” White Paper \(April 2020\)**](#): As commercial and transport fleets continue to electrify, availability of grid power to support charging is a concern. Recent studies indicate that significant increases in power generation would be needed to support the widespread electrification of automobiles. Our white paper explores how to utilize energy storage to mitigate grid power availability.
- [**“VectorStat Controller” Video \(March 2020\)**](#): DISTRIBUTED, SCALABLE, RESILIENT VectorStat® is the state-of-the-art energy management system (EMS) software from Rhombus Energy Solutions. VectorStat is an extensible and open source EMS platform that allows commercial/industrial EV charging and energy storage system (ESS) integrators to reduce their total cost of ownership and speed the time to market for their products. This video



launches the new Rhombus VS-10 single-board computer, which is optimized for the Rhombus VectorStat software platform.

We will let you know about any new assets we release in our newsletters, so stay tuned!

Quick Notes from the Electric Vehicle (EV) Ecosystem

Some interesting links to stories in the EV ecosystem during the month of May 2020:

- [NTEA 2020 Truck Product Conference](#) is now a virtual conference; dates to be released.
- [France makes EVs central to an \\$8.8B plan to rescue its auto industry.](#)
- [Tesla's switch on vehicle-to-grid technology is big news for clean energy shift.](#)
- [Peer-to-peer electric car charging is wild – and possibly revolutionary.](#)
- [California may soon mandate Uber and Lyft shift to electric vehicles.](#)
- [Electric car sales doubled in the midst of Coronacrisis.](#)
- [Solar energy farms could offer second life for electric vehicle batteries.](#)
- [Fiat starts work on largest vehicle-to-grid pilot project in world.](#)
- [Very fast electric-car charging will require a new generation of cables – and cable cooling.](#)
- [Startup Amply Power raises \\$13.2M for fleet electric vehicle charging.](#)
- [Connected EVs could help power the grid: California utility shows how.](#)

About Rhombus Energy Solutions

Rhombus develops and manufactures next-generation bi-directional electric vehicle charging infrastructure, high-efficiency power conversion systems, and energy management system (EMS) software for vehicle-to-grid (V2G) capable electric vehicle fleet charging, energy storage, and microgrid applications. The high reliability of our solutions is the result of decades of experience developing high-power systems for a variety of applications and deployment scenarios, including UL-1741SA system-to-grid solutions. For more information, please visit www.rhombusenergy.com.

