

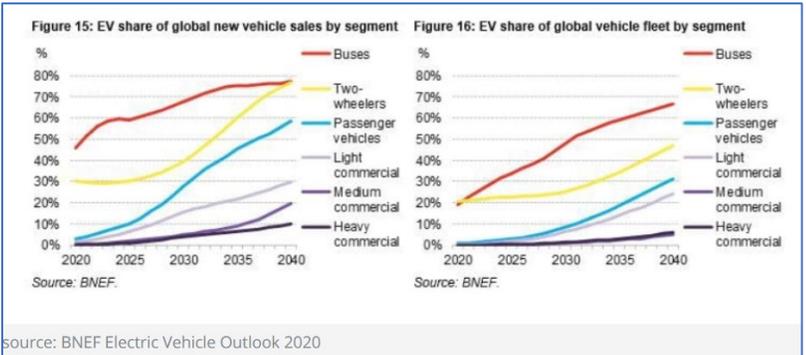


Electric Bus Deployments – Continuing to Lead The Medium/Heavy Duty Electric Vehicle Market

Electric transit buses continue to lead the medium/heavy duty (M/HD) electric vehicle (EV) market based on the number of vehicles deployed. There are roughly 500,000 electric buses worldwide, according to the [Electric Vehicle Outlook 2020](#) by Bloomberg New Energy Finance (BNEF). While a number of cities have deployed pilot electric bus programs, several have entered the next phase and started to deploy electric buses in large numbers. Some examples of this include:

Moscow: Mosgotrans, the operator of the city buses, initially started with a deployment of 100 electric buses in 2018. The Mosgotrans fleet has grown to 450 buses today, and in 2024 the city expects to have up to 2,600 buses electrified. This would represent one-third of the total bus fleet. The buses today are coming from Russian bus companies [Kamaz](#) and [GAZ](#).

London: Home of the largest electric bus fleet in Europe, the [London United RATP Group](#) is now starting a vehicle to grid (V2G) pilot program. The program is a joint effort between Leeds University, Transport for London, BYD (the bus manufacturer), UK Power Networks, and SSE Enterprises. The program is part of the SSE Enterprise [Bus2Grid Program](#), and will deploy 28 V2G-capable buses with a combined energy storage of 1MWh.



Mexico City: The Mexico City transit agency *Metrobus* is now deploying its first electric buses in a pilot program. The city is deploying ten (10) buses from Chinese bus manufacturer Yutong. Each bus holds up to 160 passengers, and has a 564 kWh battery capacity with a roughly 200-mile range. The program expects to have all ten buses deployed by the end of 2020.

BNEF projects that EV transit buses will make up nearly eighty percent (80%) of new transit bus sales, and will make up roughly two-thirds of the global transit bus fleet by 2040.

Rhombus Energy Solutions Closes Series C Funding Round

Rhombus Energy Solutions announced the closing today of its Series C funding round. The round was financed by a consortium led by [Emerald Technology Ventures](#), [Cycle Capital](#), and [inci Holding](#), and also included existing Rhombus investors. Rick Sander, Rhombus CEO, stated “With the new investment, Rhombus will continue to scale its team and operations to accelerate product development, expand sales and marketing reach and fulfil the needs of its fast-growing customer base.” Rhombus, which has shipped over 800 bidirectional high-power EV chargers and smart inverters worldwide, will use the funding to develop next-generation power system architectures and technologies, as well as scale current operations.



Energy Storage Continues to Grow Worldwide

In the face of grid disruption, peak usage surcharges, and other disruptions to the worldwide electricity supply, energy storage continues to increase in popularity. Whether at the consumer level with products such as [Tesla’s PowerWall](#) or industrial-grade installations, 2019 and 2020 have seen rapid deployment of new energy storage capacity. In Q2 2020, 288MWh of energy storage was deployed according to [Wood Mackenzie and the U.S. Energy Storage Association](#). This was the second largest quarterly deployment after Q4 2019, which was about 10% larger than Q2 2020. Better yet, Q3 2020 is expected to be even larger, and could eclipse Q4 2019. Hawaii and California lead the way for residential energy storage deployments, with about 80% of the total residential deployments in the US. One of the main reasons for this is the continued decline in the price of battery-based energy storage, which has dropped 85% over the last ten years.

On the state level, the Puerto Rico Energy Bureau (PREB) and the Puerto Rico Electric Power Authority (PREPA) continue to debate on energy modernization plans for the island. The impact of recent earthquakes, COVID-19, and Hurricane Maria, not to mention PREPA’s bankruptcy, have driven the government to look for new answers in its quest for energy reliance. This includes roughly 1.4 GW



of new battery capacity for the island and nearly twice that in solar capacity. [Both Duke Energy and Southern California Edison](#) (SCE) are looking at even larger programs, with SCE proposing the deployment of over 50GW of new utility grid-level storage by 2045. This compares with the largest battery storage deployment to date, a [250 MW storage system](#) in San Diego (pictured

above). If SCE's projections are correct, there would be nearly 100 of these solutions deployed in Southern California over the next twenty-five years. Given the volatility of the California energy market (on August 14th the price for a MW of electricity almost reached \$1,000), the opportunity to take economic advantage of stored electrical energy has never been stronger.

Vehicle Manufacturers Continue to Invest Heavily in the EV Market

In last month's newsletter, we noted that startup [Nikola Motors](#) had [received](#) an order for 2,500 trucks from Republic Services, the second-largest refuse hauler in the US. This month, General Motors (GM) [announced](#) the acquisition of an 11% stake in Nicola for \$2B, setting a value for Nicola roughly \$18B. GM will also get a seat on Nicola's board of directors. Perhaps more importantly, GM will [engineer and manufacture](#) Nicola's Badger electric pickup truck, which will utilize GM's Ultium battery system. The Badger is expected to start production in late 2022.



In the medium and heavy duty (M/HD) truck market, it looks like the prediction of 54,000 electric trucks on the road by 2024 [might actually be conservative](#). [Xos Trucks](#), an EV startup focused on the M/HD market, [just raised \\$20M](#) to ramp up production of its vehicles. The company has already sold a number of its Class 6 EV skateboard chassis, known as the "X-Platform" to UPS and Loomis Armored. [Bollinger Motors](#), another EV truck startup focused on SUVs and work trucks, [announced](#) a new platform known as "Deliver-E" for the Class 5 delivery truck market, with battery capacities from 70 kWh to 210 kWh.

Charging all of these electric vehicles is in many ways the "final challenge" for the EV market. To help this, Southern California Edison (SCE) has [announced](#) a plan to install almost 40,000 chargers this decade. The plan, with a price tag of \$437M, was approved late last month by the California Public Utilities Commission (CPUC) as part of California's plan to put 5 million zero-emission vehicles on the road by 2030. California currently leads the US in the deployment of electric vehicles, with cumulative sales in the state of [nearly 670,000 EVs](#). EVs represents 4.8% of all vehicles sold in California and nearly half of all EVs sold in the US, second only to China in total number of electric car sales.

Rhombus Energy Solutions Webinar on V2G Deployments for EV Fleets with Blue Bird, Nuvve

Rhombus Energy Solutions held a webinar with [Blue Bird Bus](#) and [Nuvve](#) on August 27, 2020. The webinar had 330 registrants, and over 200 live attendees that heard about best

practices for EV fleets to deploy V2G solutions. If you missed the webinar, you can see the recording of it on the Rhombus Energy Solutions YouTube channel; just click on this [link](#). You can also subscribe to the Rhombus YouTube channel and/or view any of our other video content [here](#).



Quick Notes from the Electric Vehicle (EV) Ecosystem

Some interesting links to stories in the EV ecosystem during the past month:

- [Energy storage for EV charging can lower demand charges.](#)
- [US government agencies join 'world-wide race to capture the advanced battery market'.](#)
- [Electric-Car Startup Lucid to Follow Tesla Into Energy Storage.](#)
- [How Convenient! Ultra Fast Battery-Boosted EV Charging at ampm Stores.](#)
- [Volvo's electric bus batteries to gain a second life in energy storage.](#)
- [Alfen reports 'strong profitability': EV charging, energy storage segments make biggest gains.](#)
- [Hawaiian Electric applies for approval for 2 energy storage projects.](#)
- [US risks green tech leadership as Europe makes play with COVID-19 stimulus.](#)
- [Could electric vehicles pose a threat to our power systems?](#)

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.

