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Charging electric-vehicle fleets: How to seize the emerging opportunity

By 2030, the US market for energy-optimization services to support the charging of electric-vehicle fleets could be worth $15 billion per year. Here is how companies can capture the opportunity.

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As more people and organizations acquire electric vehicles (EVs), companies will have chances to lift their revenues not only by selling more electric power and charging infrastructure but also by providing services that support the charging of EVs. EV fleets represent a particularly promising segment of the potential market for charging services, which can help fleet operators reduce their costs by procuring and managing energy in efficient ways. In the United States, the market for fleet-charging services could amount to $15 billion per year by 2030. Although this market is fragmented and undeveloped, it is not too early for companies to position themselves to compete in it. Companies should recognize that delivering these services will likely require new business models—and prepare accordingly.

Finding the profit in EV fleet charging

Thanks to such factors as falling costs, widening availability, and support from policy makers, US sales of commercial EVs have continued to grow. Looking ahead, the operators of vehicle fleets may be especially enthusiastic buyers of EVs. EVs do cost more than comparable vehicles with internal combustion engines (ICEs). However, their superior efficiency, the moderate price of electricity, and the high utilization of fleet vehicles allow fleet operators to quickly recoup the extra up-front cost of an EV and achieve a lower total cost of ownership. Our estimate suggests that fleet EVs can have a total cost of ownership that is 15 to 25 percent less than that of equivalent ICE vehicles by 2030.[1]

Assuming widespread EV adoption, McKinsey projects that commercial and passenger fleets in the United States could include as many as eight million EVs by 2030 (compared with fewer than 5,000 in 2018), which would amount to between 10 and 15 percent of all fleet vehicles. Powering those EVs will require a great deal of investment and infrastructure. McKinsey estimates that the United States will need some $11 billion of capital investment by 2030 to deploy the 13 million chargers needed for all of the country's EVs.[2] Fleet EVs alone would consume up to 230 terawatt-hours of power per year, which would be approximately 6 percent of current US power generation. Their batteries would offer roughly 30 gigawatt-hours of electricity-storage capacity, or 15 to 20 percent of projected capacity in 2030.

Mass deployment of EV charging infrastructure will bring opportunities to run that equipment more efficiently and cost effectively. Our estimates indicate that services to support the charging of EV fleets could be worth some $15 billion in annual revenues and cost savings. Much of that money would come from three activities (exhibit).[3]

— *Procuring renewable power directly from the source.* Purchasing electricity directly from off-grid generation facilities, rather than the power grid, could yield $8.6 billion in cost savings, thanks to the difference between retail and wholesale energy prices (without accounting for avoided demand charges, which we discuss below). Our analysis suggests that in many geographies, the least expensive form of off-grid power would be solar, generated from onsite installations or purchased under direct contracts with large-scale installations.

— *Offering energy-management services.* Commercial-scale batteries would let fleet operators buy power during off-peak hours and use the stored power to recharge EVs when electricity prices are highest. Practicing time-of-use arbitrage in this way could produce cost savings of roughly $4.4 billion.

[1] Estimates based on urban and regional use cases for commercial fleet vehicles.

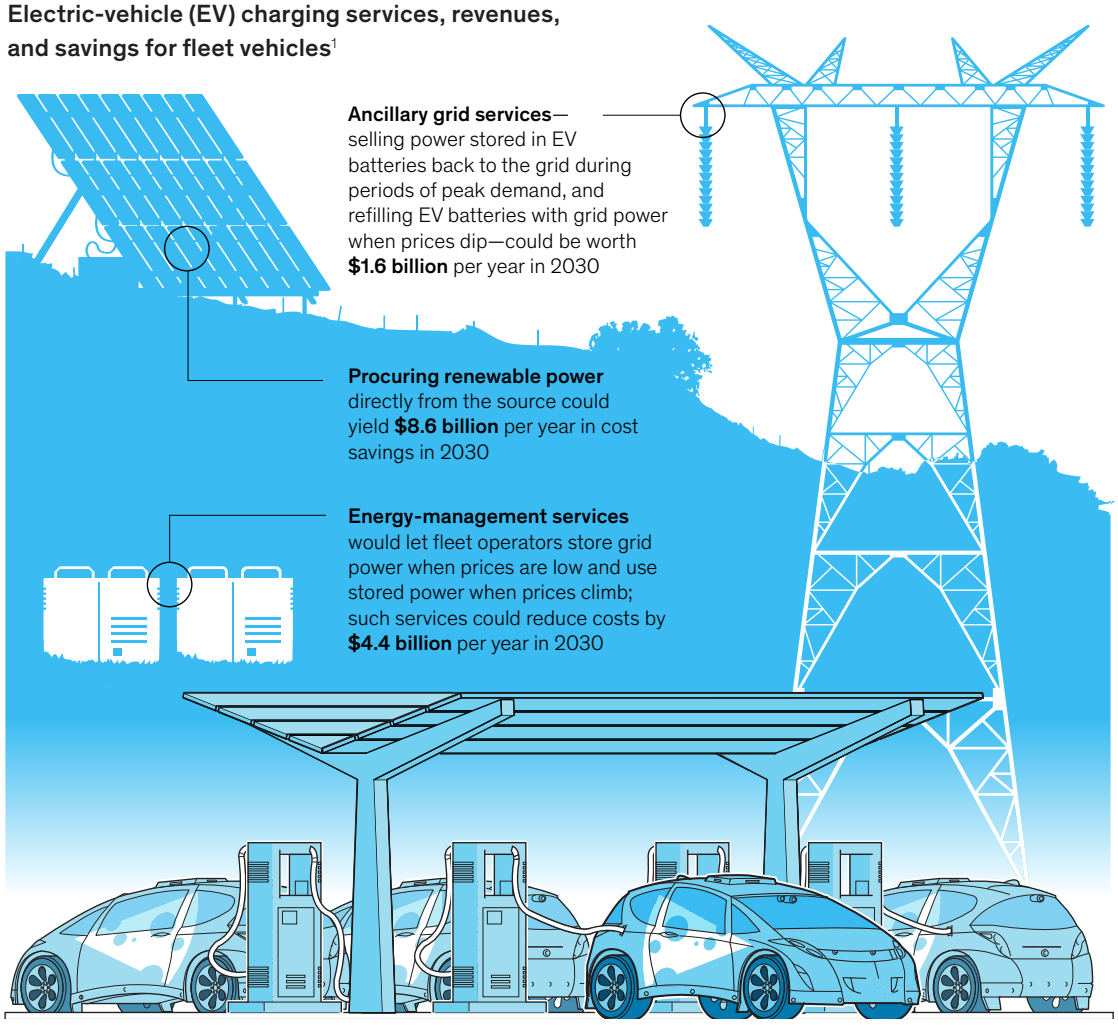
[2] Hauke Engel, Russell Hensley, Stefan Knupfer, and Shivika Sahdev, "Charging ahead: Electric-vehicle infrastructure demand," August 2018, McKinsey.com.

[3] The projected cost reductions and revenue gains are based on the electric-vehicle-fleet-size projections presented in the article, along with projected renewable-power prices and demand charges to 2030. These do not account for the potential prices of fleet-charging services or the costs to deliver them, only for the differences between retail and wholesale energy prices, for the differences between peak and off-peak energy prices, and for avoided demand fees. Projections of the amounts of electric power that US-based electric-vehicle fleets will purchase directly from renewable sources and from the grid are based on an assumption that fleet operators will use the least expensive energy sources available (taking demand charges into account) in each region. Projections also assume that no major shifts in policy will affect the relative costs of directly purchased renewable power and grid power.

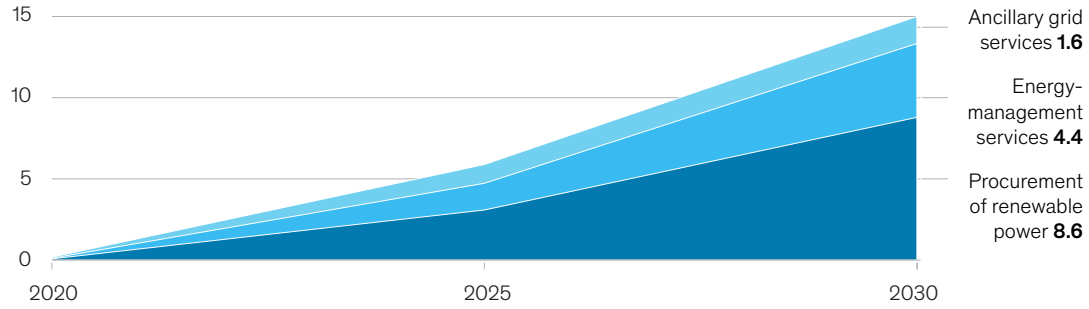
Exhibit

By 2030, the US market for services to support the charging of electric-vehicle fleets could be worth $15 billion.

Electric-vehicle (EV) charging services, revenues, and savings for fleet vehicles[1]



Combined revenues and cost savings by type, $ billion[1]



[1] The cost savings and revenue gains shown relate only to charging services for electric-vehicle (EV) fleets, not to sales of charging infrastructure or electric power used by fleet vehicles. The projected cost reductions and revenue gains are based on the EV-fleet-size projections presented in the article, along with projected renewable-power prices and demand charges to 2030. These do not account for the potential prices of fleet-charging services or the costs to deliver them, only for the differences between retail and wholesale energy prices, for the differences between peak and off-peak energy prices, and for avoided demand fees. Projections of the amounts of electric power that US-based EV fleets will purchase directly from renewable sources and from the grid are based on an assumption that fleet operators will use the least expensive energy sources available (taking demand charges into account) in each region. Projections also assume that no major shifts in policy will affect the relative costs of directly purchased renewable power and grid power.

— *Providing ancillary grid services.* Selling power stored in EV batteries back to the grid during periods of peak demand, which is a form of "vehicle to grid" (V2G) service, not only lessens maximum loads on the grid but also allows EV owners to capitalize on high electricity prices. Similarly, charging stations can be configured to refill EV batteries with grid power when prices dip. Doing this helps vehicle owners avoid demand charges (additional fees, levied according to the maximum rate at which power is drawn), which can make up about 90 percent of a charging station's electric bill.[4] Fleets with lower vehicle utilization and reliable charging patterns would be particularly suitable for V2G services. School buses, for example, have predictably low utilization during hours when power demand peaks. Setting EV-recharging patterns to deliver V2G services and minimize demand charges could generate $1.6 billion in cost savings and revenues.

We believe that opportunities in EV fleet charging will materialize first in places with high-demand charges and sunny weather, which makes solar-power generation more economical. A favorable policy environment is important, too. Just as policies have aided the growth of the US market for EVs, they could also help the EV fleet-charging market to develop. No fewer than 15 states and territories offer incentives and tax credits for the installation of EV charging stations. (One reason for policy makers to support the development of the fleet-charging sector is that optimized fleet charging could also bring about other outcomes, such as reduced use of energy-intensive thermal "peaker" plants, expansion of renewable-generation capacity, and lower emissions of greenhouse gases and air pollutants.)

Capturing opportunities in EV fleet charging

We believe that companies can best capture the opportunities in the EV fleet-charging market by offering a well-rounded set of services. To do this, four elements will need to be in place:

— *Hardware and software integration,* which helps fleet operators optimize energy and vehicle use by setting driving schedules and routes, charging intervals, and vehicle maintenance in alignment with customer demand, power prices, traffic conditions, and charging-station availability. Such solutions may need to be customized or developed.

— *Digital, analytics, and connectivity* supporting activities across the value chain, from data management to customer communications.

— *A large base of installed EV chargers* running at high utilization rates.

— *Access to price signals* from the power market, which can help optimize charging by enabling real-time decisions and avoiding peaker-plant energy generation.

Several kinds of companies have begun offering EV fleet-charging services, though they have yet to develop all of the capabilities described above. Solar-power companies have ventured into the business, generally with solutions that target individual vehicle owners rather than fleet operators. A segment of solar companies, solar carport providers, serves commercial and municipal fleets. But few of those offer substantial storage capacity, and their off-grid systems carry high balance-of-system costs (required costs related to hardware, software, and services other than the solar panel or battery).

Utility companies manage most customer touchpoints and data, so they are well positioned to market new offerings. However, in the United States, about 60 percent of US power demand is found in competitive generation markets, where offering integrated charging services is difficult because power producers and distribution utilities must be separate companies. Makers of EV charging equipment are moving further downstream into energy management and operations, but few of them generate power. Nor do providers of energy-management services.

[4] Stefan Knupfer, Jesse Noffsinger, and Shivika Sahdev, "How battery storage can help charge the electric-vehicle market," February 2018, McKinsey.com.

Companies that wish to provide EV fleet operators with charging services will need to look beyond existing business models. It may require an investor or a well-capitalized business to combine multiple entities into one with all the right capabilities, or complementary businesses to join forces in a partnership.

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