

## Ev charging station development

Although the United States has long lagged other regions in electric vehicle (EV) adoption, the country is now reporting record growth. EVs represented about 8 percent of all new passenger cars sold in the United States in 2022, up from around 5 percent in 2021.<sup>1</sup> Maximilian Fischer, Nicolaas Kramer, Inga Maurer, and Rachell Mickelson, "A turning point for US autodealers: The unstoppable electric car," September 23, 2021, McKinsey. By 2030, this figure could rise to 53 percent.

These insights were developed by the McKinsey Center for Future Mobility (MCFM). Since 2011, MCFM has worked with stakeholders across the mobility ecosystem by providing independent and integrated evidence about possible future-mobility scenarios. With our unique, bottom-up modeling approach, our insights enable an end-to-end analytics journey through the future of mobility--from consumer needs to a modal mix across urban and rural areas, sales, value pools, and life cycle sustainability. Contact us if you are interested in getting full access to our market insights via the McKinsey Mobility Insights Portal.

The United States will need about 28 million ports by 2030 to meet the demand for electricity by zero-emission passenger vehicles (Exhibit 1). Private ports are expected to increase in number from around 2.5 million to nearly 27 million, representing about 95 percent of the total.

There are two types of public charging: direct current fast charging (DCFC), which is used on highways and for fast fill-ups, and slower Level 2 (L2) charging, which is available at places such as grocery stores, malls, car dealerships, golf courses, and banks, where people may park for longer periods. L2 charging may also occur next to sidewalks or near street parking. About 150,000 L2 and DC plugs are now available across the United States, but that number is expected to increase to 1.5 million by 2030, when they will represent about 5 percent of the total.

While public fast charging is a piece of the overall charging solution, current EV demand for electricity is still so low that profitability is challenging--and this could remain the case over the short to medium term. To help charge-point operators improve their financial picture both now and during scale up, we examined the EV market, including the ongoing shifts in ownership patterns and charging demand. We then analyzed the factors that influence charging station revenues and identified potential improvement levers for optimizing profitability. Among the most important: a focus on utilization and pricing.

Currently, most EV owners tend to be home owners with access to a home charger, and they often have a second vehicle for long-distance trips. But even people that fit this profile will sometimes need public charging. For instance, they might forget to charge their vehicle overnight and thus need to charge on the road, or they might find that the slow L2 charger at their workplace parking garage, where they usually connect during an eight-hour workday, is out of commission. Additionally, long journeys--those over 150 to 200 miles--will necessitate public charging.



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As EVs become more common and their owners no longer come primarily from higher income groups, the percentage of charging that occurs at home is expected to fall to 50 percent by 2030 (Exhibit 2). Although about 65 percent of the US population own or rent a single-family home, many people lack garages where a charger could be placed, or find that installation is prohibitively expensive.<sup>2</sup> 2021 Census American Housing Survey. Apartment dwellers may also lack a suitable installation site or encounter resistance from landlords who do not want chargers on the premises. In such situations, public charging, either fast or overnight, is the mainstay.

Recognizing the need for public chargers, many new players are now entering the sphere. For instance, some major automakers are banding together to invest a minimum of \$1 billion in a joint venture that will build stations with about 30,000 fast chargers in urban and rural areas of the United States.<sup>3</sup> Mike Colias, River Davis, and Ryan Felton, "Big Automakers Plan Thousands of EV Chargers in \$1 Billion US Push," The Wall Street Journal, July 26, 2023.

While charge-point operators can follow multiple strategies for generating revenues, two business models are now most common (Exhibit 3):

Regardless of business model, the up-front capital costs for fast charging stations are high. A 150 to 350kW DCFC charging unit can cost anywhere from \$45,000 to over \$100,000, and installation costs can range from \$40,000 to over \$150,000. Additionally, grid upgrade and integration costs can amount to millions, depending on the number of fast chargers installed at the location.

We examined the economics for a hypothetical DCFC charging station with an owner-operator business model in California. In line with typical patterns, we assumed the charging station would have 4 150kW chargers.<sup>4</sup> FWHHA NEVI Formula Program Guidance, US Department of Transportation, Federal Highway Administration, June 2, 2023. In our first analysis, we assumed that the charge-point operator did not receive any government subsidies or credits; in the second, it did.

Assuming 15 percent utilization--equivalent to about seven 30-minute charging sessions per day--our hypothetical station would generate \$265,000 to \$285,000 in annual revenue, given a price of \$0.45 per kWh dispensed. (Pricing may vary by time of day). On the cost side, we assumed annual expenses of \$220,000 to \$250,000 for electricity, demand charge rates, fixed operational expenditures, R& D, and SGA.<sup>5</sup> We calculated demand charges by assuming a cost of \$20 per kilowatt, with peak demand of 480kW per month. Capital expenditure depreciation would total about \$85,000 to \$95,000 yearly. With these metrics, the station would lose about \$40,000 to \$50,000 per year in EBIT (Exhibit 4).

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