

Leave the Filling Station Behind

Wireless charging changes how, when,
and where EVs will “fill up” – and makes
charging as easy as park, and charge



Introduction

In 1973, and again in 1979, cars lined up sometimes for blocks on end at filling stations – with gas rationing and consumer panic replacing the laws of supply and demand. More recently, Internal Combustion Engine (ICE) owners are switching to EVs in light of the most recent oil hike in late 2021 and the realization that electricity is not nearly as volatile a commodity as oil and is better for our environment.

While we haven't yet seen EVs bumper to bumper in lines like the 1970s, consumers, unfortunately, still rely too heavily on the "filling station" mindset. Level 3 DC Fast Charging (DCFC) kiosks at gas stations and rest areas will undoubtedly be crucial EV range extenders for long distance travel. However, according to Federal Highway Administration data from 2019, motorists in the U.S. drive an average of only 39 miles per day. As a result, DFC is only needed when EVs are used for longer trips that extend beyond their battery capacity.¹

It's time to change the paradigm. For the vast majority of EV use, relying on DCFC is overkill and presents inconveniences, hassles, and safety risks. Rather than a shortage of fuel, a perceived shortage of DCFC stations will be the cause of any lines at the "pump."

What's the future of EV charging?

One of the great benefits of EVs is there is no need to make a trip to a filling station when you're low on fuel – electricity is available most places that cars are parked, so people can charge at home, at work, or while shopping. In other words, charging while they are taking care of other errands, so the charging doesn't become the errand. Cars are parked 96% of the time², which provides ample downtime to charge.

EV production is ramping up today, and the public dialogue continually reinforces the flawed notion that those EVs will require many more public DCFC charging stations outside of highway corridors. McKinsey & Company estimates that the number of battery electric and plug-in hybrid electric vehicles is expected to hit 120 million by 2030.³ Reinforcing this number is President Biden's executive order setting a national goal to have half of all new vehicles sold by 2030 be electric. However, McKinsey expects the EV boom to lead to a corresponding bottleneck: "If consumers purchase EVs at the expected rates in the next five to 10 years, a lack of charging infrastructure could become an obstacle to EV adoption."⁴

How many chargers will be needed? According to McKinsey, 30 million private and public chargers – at a cost of \$50 billion of cumulative capital – will be needed to support the EV demand. (Compare that to only 168,000 gas stations in the United States.)



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This prediction is especially relevant considering DCFC's considerable price tag. According to two independent studies by the National Renewable Energy Laboratory (NREL) and Ceres/M.J. Bradley & Associates, the average cost to install a DC Fast Charging station will be between \$40,000 and \$55,000.⁵ However, even the fastest Fast Charging stations (350 kW) are still ten times slower than a gas pump. Because gasoline is so energy dense, filling with a gas pump is the equivalent of charging at over 6 megawatts charge rate.





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How much, exactly, is 6 MW? That’s roughly half the overall daily production of an industrial wind turbine on a windy day. That’s roughly 30 minutes of waiting around for the car to be charged. (Or 30 minutes in a remote parking lot worrying about safety while the car is charging.) Imagine the lines at DCFC “gas stations” when every car is sitting at the pump for a half an hour just to fill up.

This, simply put, is why DCFC is not a practical or realistic solution for a vast majority of EV drivers in a vast majority of (non-long distance, non-range extending) uses. Add to that the lower price tag compared to DCFC (Average \$3000 cost for Level 2 charging compared to \$40,000-\$55,000 for DCFC⁶). Utility company upgrade fees and monthly “demand charges” can add hundreds of thousands of dollars’ cost to the installation and operation of a DCFC station.

This is why Level 2 charging, on balance, represents the optimal compromise between charging speed on one hand and affordability/accessibility on the other – and it just so happens to be kinder to the battery, too.

The future is *wireless*, distributed charging

Consider when WiFi internet access was still being rolled out. When both WiFi and hardwire Ethernet access were available, how often did users opt for the physical cable? In other words, given the choice, what laptop, tablet, or smartphone user would prefer to forego WiFi so they could instead physically plug their device into an Ethernet jack?

A similar self-evident question might one day be asked about how EVs fill up their batteries.



Corded Level 2 chargers are clumsy, dirty, and inherently more failure prone due to the complex connector and large number of insertions it must handle. Wireless Level 2 charging is also a better solution for poor weather conditions such as rain and snow. After all, who wants to plug in a high-voltage cable when standing out in a parking lot in the rain? And visit a parking lot after a snow storm: snow plows are notoriously hard on corded charging stations.

Moreover, standards complications have created frustration in the world of the plug. When you buy an EV, you simply cannot know if your model will be compatible with the majority of corded chargers available to your EV in the future, especially as the marketplace is still very much in flux. By contrast, OEMs are collaborating on a common standard for wireless charging. WiTricity worked for over a decade with automakers around the world, and their suppliers, to set global standards for passenger vehicles. As a result, wireless charging built on the company's patented technology is the basis of the technical standards by SAE International, the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the Standardization Administration of the People's Republic of China.

As with the ultimate dominance of WiFi internet over corded, multiple factors are converging to determine who will dominate the EV charging space tomorrow. With more than 1,100 patents covering the technology that forms the backbone of multiple global standards and a wide variety of wireless power applications, WiTricity is leading the wireless charge. Given wireless' convenience, simplicity, and speed (WiTricity wireless EV charging boasts identical charge times as corded), it is safe to project that wireless charging will play an increasingly substantial role in the market. Reinforcing this market dominance is the ability to continually extend a vehicle's range by "power snacking™" throughout the day with wireless charging.



Wireless Level 2 chargers, as compared to corded Level 2 chargers, offer a simple, clean, reliable, and robust method of charging.



WiTricity delivers:

- ✔ Level 2 charging that is as fast and as efficient as the plug.
- ✔ Scalable charging rates to meet the needs of vehicles ranging from PHEVs with small capacity battery packs to EVs with high-capacity, long-range battery packs and heavy duty vehicles.
- ✔ The ability to charge vehicles ranging from low-ground clearance sports cars to medium-ground clearance sedans to high-ground clearance trucks, with a single system charger design.
- ✔ The ability to be installed as an on-ground charging pad or buried in the pavement.



WiTricity, using a wireless charging technology called Highly Resonant Wireless Power Transfer, offers a high efficiency 11 kW EV charging system that, according to independent U.S. Department of Energy testing, is the most efficient and interoperable wireless charging system available today.

EV consumers and OEMs, attuned to marketplace trends, are increasingly turning toward new Wireless Level 2 charging solutions to break free of the “filling station” mindset and make charging as simple as parking a car.

Visit WiTricity’s website (www.witricity.com) today to learn more.

Endnotes

1. Ceres and M.J. Bradley & Associates Industry report drawn from a national analysis conducted by the National Renewable Energy Laboratory (NREL)
2. David Z. Morris, “Today’s Cars Are Parked 95% of the Time.” Fortune (March 13, 2016) citing work by transportation researcher Paul Barter/Reinventing Parking (“Cars are parked 95% of the time.’ Let’s check!” ReinventingParking.org (Feb. 22, 2013))
3. Hauke Engel et al, “Charging ahead: Electric-vehicle infrastructure demand.” McKinsey & Company (Aug. 2018)
4. *ibid.*
5. Ceres/M.J. Bradley & Associates LLC, “Accelerating Investment in Electric Vehicle Charging Infrastructure” report (Mar. 2018) p. 24; Eric Wood et al, “Analysis of Fast Charging Station Network for Electrified Ride-Hailing Services” SAE Technical Paper 2018-01-0667, 2018, doi:10.4271/2018-01-0667.
6. “The DOE estimates that the installation costs for public Level 2 chargers vary from \$600 to \$12,700 with an average of \$3,000 per port.” *ibid.*



About WiTricity

WiTricity is the global industry leader in wireless charging, powering a sustainable future of mobility that is electric and autonomous. WiTricity's patented magnetic resonance technology is being incorporated into global automakers' and Tier 1 suppliers' EV roadmaps and is the foundation of major global standards developed to support wide-scale adoption. Advancements like dynamic charging of moving vehicles, and the charging of autonomous robots and vehicles without human intervention all depend on WiTricity technology. See how WiTricity enables a magically simple, efficient charging experience.

www.witricity.com

