QUALCOMM HALO™

The future of electric vehicle charging is wireless

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In July 1991 the first GSM phone call was made, revolutionizing mobile communications and kick starting a global industry. According to the GSM Association, there are in excess of 7 billion mobile connections worldwide,[1] something few would have imagined twenty-five years ago. Cables are now old fashioned and we are all part of the wirelessly connected society with 3G, 4G, Wi-Fi – and now wirelessly charged devices are entering the market.

Wireless expansion

Wireless continues to expand into new industry sectors. Wirelessly connected vehicles are emerging as the automotive industry begins to introduce innovative wireless communications and services into vehicles. Car manufacturers are also increasing Electric Vehicle (EV) development to meet CO_2 legislation and air pollution concerns that are impacting our health.[2] EV sales are forecast to increase[3] and we expect all vehicles including EVs to eventually become wirelessly connected.

Wireless innovation does not stop with connected vehicles. Charging your EV will soon become cable-free and as simple as charging your electric toothbrush; both use magnetic induction to charge the battery. However, there are two main differences: the charge transferred to your EV will be much greater and there will be a large air gap between the charging pad on the ground and the receiving pad on the EV. Sophisticated Wireless EV Charging (WEVC) technology will be required to achieve this efficiently.

To bring WEVC to the automotive industry, Qualcomm has been innovating around WEVC technologies to develop its Qualcomm Halo™ WEVC technology that is convenient for drivers, simple to use and enhances the overall EV charging experience.

Meeting customer needs

For long-term commercial success though, WEVC has to meet two basic customer needs: first, it should deliver a better charging experience and second, drivers should be able to charge at any wireless charging location: at home, the office, supermarket, a parking lot, or in fact anywhere. WEVC charging equipment therefore needs to be interoperable to enable any EV to wirelessly charge with equipment from any manufacturer in the same way that any mobile phone works with any mobile network anywhere in the world. Standards Development Organizations, such as SAE International (the Society of Automotive Engineers), are working on agreeing a WEVC standard that will support interoperability between equipment from different manufacturers. The first draft proposal should be available in the next 12 to 18 months.

High power is a must for fast charging

Early WEVC systems for passenger vehicles transfer power to the EV at 3.3 kW and to charge a battery with storage capacity of around 23 kWh typically takes 7-8 hours, so is usually an overnight charge. Studies however indicate that drivers want faster charging, ideally fully

[1] https://gsmaintelligence.com/
[2] http://www.who.int/mediacentre/factsheets/fs313/en/
[3] http://www.navigantresearch.com/research/electric-vehicles-in-europe

charging in 2 hours.[4] A 6.6 kW WEVC system would half the above charge time to 3-4 hours while 20 kW would mean a full charge in around 1 hour. Public WEVC system could also enable periodic snack charging of a few minutes making charging more convenient for the driver. Qualcomm envisions widespread public deployment of high-power WEVC system that could reduce range anxiety and the requirements for high-capacity batteries on some EVs.

Efficiency

Charging should be energy efficient, comparable to conductive charging, so as not to waste energy. Efficiency should therefore exceed 90% while still maintaining ease-of-use and avoiding the need for precision parking. Charging efficiency should also be consistent with different ground clearance EVs (think sports car to Sports Utility Vehicle (SUV)) and potentially charging pads buried beneath the charging bay surface. The WEVC system therefore has to work at high power, high efficiency and across a large air gap between the charging pads.

Circular, Double D and Multi-coil technology

Car manufacturers will need to combine high power, ease of use and efficiency with their own requirements for small, lightweight vehicle pads at a competitive price. To this aim, Qualcomm has developed its Qualcomm Halo™ WEVC technology for circular, double D and multi-coil resonant magnetic induction power transfer. This spans the car industry requirements of a low cost entry vehicle pad for low ground clearance EVs, to high power, high performance vehicle pads with greater alignment tolerance supporting efficient energy transfer across a large air gap. Qualcomm Halo™ WEVC technology therefore addresses the charging requirements for a wide range of vehicles, without the need for complex alignment mechanisms or large charging pads on the vehicle. Importantly, Qualcomm Halo™ WEVC technology provides a road map to dynamic charging-on-the-move, which could mean almost unlimited EV driving range.

Wireless EV Charging adoption

Will wireless become the preferred EV charging option? At Qualcomm we believe so, and are building the industry eco system to make this happen. Consider consumers between 18-25 years of age who have been brought up in the era of smartphones and internet-everywhere. This Millennial Generation, as they are often referred to, expect technology to be simple, elegant and efficient. This generation will become a significant part of the car-buying market over the next ten years and their requirements and tastes will help shape the future of the automotive industry. We believe wireless charging will be their preference.

Predicting the future

Qualcomm expects WEVC technologies to continue to permeate our lives, probably bringing change and innovation at a faster pace than was experienced in the early 90's. Therefore predicting the future based on what has happened so far in the global wireless revolution suggests that the automotive industry is set for some interesting times.

[4] http://www.adac.de/infotestrat/adac-im-einsatz/motorwelt/elektroakzeptanz_studie.aspx