Formula E racing tech will improve the charger for your electric car

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- The control panel for one of the Enel X DC fast chargers used by each Formula E team. The rest of the charger is hidden behind the panels that line each temporary garage, and the Formula E race cars use a custom charging plug (not pictured).
- Mechanics and engineers work in the Jaguar I-Pace eTrophy paddock as the I-Pace race cars recharge.
- Jaguar is using nearly stock I-Paces for the eTrophy, and similarly the chargers from ABB are based on production units, not custom-made for the sport.
- Two of these Enel L2 chargers were also in the pit lane for topping up the batteries on the support vehicles. In the past, Formula E had used Qualcomm's wireless Halo charging tech, but Qualcomm appears to have ended its relationship with the sport.

Jonathan Gitlin

BROOKLYN, New York—This past weekend, the Formula E electric racing series made its annual return to these shores, racing in Red Hook against the backdrop of the downtown Manhattan skyline. When the checkered flag waved on Sunday, it marked

the end of Formula E's fifth season. I'll have some more thoughts on the race weekend itself, as well as how the series has matured over the past half-decade shortly. But first, I wanted to look at an aspect of the sport that maybe we've neglected down the years. It's one that probably has more direct relevance to anyone who owns an electric vehicle than any other aspect of EV racing—DC fast charging.

Perhaps it should have been obvious. After all, I've written thousands of words about the reasons why car companies decide to enter motorsports. Every racing series balances competing aspects—being a sporting competition, being entertainment for the public, being a marketing platform, and being an arena for research and development for new road-car technology.

While I'm not naive enough to think that technology transfer into road cars is the most common or predominant reason to go racing, it's also not an avenue that should be dismissed out of hand. Windshield wipers, disc brakes, dual clutch transmissions, and even direct injection engines were proven on track before filtering their way into the showroom. For the automotive OEMs that are flocking to Formula E, this is one of the attractions, particularly as the series is keeping a tight control of things like race-car aerodynamics that can explode budgets without a scintilla of relevance for street cars.

It's not just cars that benefit from racing-technology transfer

As it turns out, the car makers aren't the only companies that want to go racing for this reason. It's immediately obvious why multinational energy companies like ABB and Enel X would be interested in Formula E from a marketing perspective. But both are also using the events as a high-pressure crucible for their charging systems.

"We're behind the scenes with the technology on the charging.

And I think we look at this as an opportunity for innovation. So some of the products, some of the technology that you're seeing in terms of extended battery life, but also higher-power charging, that's being tested out, it's being run here, put into place, and then it shows up really soon," said Preston Roper, head of Enel X's North American electric mobility division.

Enel X provides the DC fast chargers that every Formula E team uses to recharge the 54kWh batteries in each of its two race cars. This can only be done at specific times during the event, with the rules restricting charging during qualifying, the race, and any time the cars are in what's called *parc fermé. (*Enel also had a couple of 240v AC level 2 chargers in the pit lane, used for recharging the batteries in the BMW hybrids that Formula E uses as the series safety cars and medical cars.)

The simplest approach would probably have been a custom design for the series, but in fact these chargers are modified versions of the 50kW DC fast chargers the company has been making for a while.

"We started from a production unit we customized for motorsport, and we discovered a lot of technical things to improve," explained Alberto Venanzoni, one of Enel X's charging infrastructure specialists. For one thing, power has been increased to 80kW. "You start increasing the power [which adds] weight, and then you experience some configuration that you never experienced in the streets," Venanzoni told me.

Additionally, Enel has worked to make the chargers more suitable for life on the road with Formula E's traveling circus. "Normally, a charger of this power weighs around 300 kilos [661lbs]. With this one, the weight is 200 kilos [441lbs]. So we did a big effort to reduce the weight," explained Ilaria Vergantini, also a specialist with Enel. "Consider these chargers aren't well treated, they're moved

around a lot, and they are really, really robust," she said.

Two can play that game

Similarly, ABB could have built a completely custom solution to recharge the Jaguar I-Paces that battle it out in the Jaguar eTrophy, which entertains the Formula E crowd as a warm-up to the main event. But it also chose not to go that route.

"So the whole purpose with eTrophy is—both from Jaguar as well as us—is to stay as close to reality of what you can get in the market as possible. [Jaguar does] it from a car perspective, to take the car as it is and then just enhance the braking and the stiffness a bit around the driver, and take out the infotainment stuff. And we did a similar approach for the charger," said Frank Muehlon, managing director of Electric Vehicle Charging Infrastructure at ABB.

Muehlon told me:

> *So we said, OK, usually a charger, you install at a fixed place, and then it's sitting there, right? And then it needs to be connected to the grid and so on. The race environment is not like this. You're transported from race to race. So that's already something very unusual for a charger to be transported everywhere. I mean, you could have made it easy and just say, "OK, let's put in a few power converters and forget about the protocol." And whatever it is, you don't need any of this, right? So if we would just have trimmed it down, it would have been an easy job. And then probably every power converting company could have done it. That's not the way we approached it. The way we approached it was, we take a charger, which is really out there [in the market], which people can charge and just build it a bit smaller for transportation purposes, but make it robust enough for this race environment.*

Beyond that, Formula E also offers the usual high-pressure environment associated with motorsports. “If anything goes wrong with the charger, and they have to announce that, ‘sorry, we cannot race because we couldn’t charge the cars’—that’s some pressure, right? And there’s always something. Like there’s harmonics all of a sudden, or during transportation a part failed or whatever when it was re-erected. Or some car drove into a charger in the paddock. And so the guys need to fix it on the spot. So that pressure is definitely there,” Muehlon said.

Happily, I can report that, although much of Manhattan was plunged into blackout this past weekend, none of the races in Red Hook appeared to have any problems with recharging the race cars.

Listing image by Enel X

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