PODCAST

Charging ahead with All-electric racing

ABB Decoded

Frank Muehlon, CEO of ABB E-mobility, on ABB's new role as Official Charging Partner of ABB Formula E.

Anthony Rowlinson: Hello and welcome to the first 2023 episode of ABB Decoded– the podcast that tries to press pause on our fast-moving lives and make sense of the technology and trends that are shaping our world.

I'm your host, Anthony Rowlinson, and we're joined for this episode by Frank Muehlon, the CEO of ABB E-mobility, who's a leading voice on fast-charging and the future of electric vehicles.

As you'll hear, Frank was speaking at the final track test of the exciting new ABB Formula E Gen3 race cars, in Spain, where ABB presented its new race fast-charger.

With technology derived from road fast-chargers like the Terra 360, ABB has this year become the official charging partner of the all-electric world championship. So our portable, custom-designed fast-chargers will power 11 teams and 22 cars at race venues across the globe throughout Season 9.

That season is about to start, so before the lights turn green, let's hear what it means for ABB to be charging the world's most advanced electric racing championship.

Frank Muehlon: So I'm Frank Muehlon, CEO of ABB E-mobility. I'm with ABB since 2014, and went into the e-mobility business, heading up this business since 2017. And when I went into our business in 2017, it was a business of like, $30 million. Right. And now by 2022, we will close north of 500 million. So that is, yeah, that's what we're doing with the whole team. So everybody on the team is fully engaged.

AR: So we're speaking here today at the Valencia circuit, ahead of Season 9 of the ABB FIA Formula E World Championship – and the reason you're here is that we have become official charging supplier to the championship, so we have ABB chargers in the paddock this year for the first time. So it's a great moment for us, but particularly for the part of the business that you run. So could you tell us about what it's like seeing the chargers here in the racing environment?

FM: Yeah, so we joined the races now since a few years, right? But this is the first year where we're official charging partner. And we have been supplying, there was once this

Jaguar, I-Pace E-trophy and we were supplying chargers for those cars. And these were 50 kilowatt chargers, so one per car, 50 kilowatt. And it was already nice, because we got a lot of experience on how to interact in a race environment. But yeah, it was a sideshow, so to say and now it's real Formula E. And so we're in the middle of the race, we're part of the thing, and we customize the charger for that purpose. And of course, like having a new product and launching a new product, whether it's out in the market or whether it's now for races, it's always thrilling, right,-it's always something special.

AR: And what's it like actually seeing it here because it's quite visible in the paddock. It's quite a large, white painted box, it has red LEDs on it, you can't really miss it, it's quite a prominent part of the furniture now.

FM: Right. Absolutely, you know, it's looking nice, I think we spent some thoughts also on the design of the product. And when you look at the design, when you compare it with our flagship product the Terra 360, which is out in the market, you see some similarities. You see some similarities when you look a bit at the shape, you look at similarities when you look actually at the sheet metal and the way the holes for the airflow are designed. You see similarities a bit, in a little bit of the V-shape at least on one side. And of course, the LED strips, which is also carried over from there, which showed the indication on, is the charger available or is charging or is there potentially an error, so you really see that also from the distance. And seeing that from the distance I think is when you're an EV driver and approach a charger it's nice but now looking in the race context is also nice because everyone visiting and seeing what's happening can see from a distance what's happening. And so it's nice. I really like the product. And the fact that this product can charge two cars at the same time also makes it of course much more efficient and also from a space point of view.

AR: And what's it like when you have to integrate your technology into, you know, for a customer? This is a special kind of customer because it's a racing championship. Does that come with its own particular demands and pressures, because clearly you don't want it to go wrong? That's the first thing –it has to work. So what's that challenge like?

FM: It's a big challenge actually. I mean we do, for new cars coming to the market or new chargers coming to the market, you always need to do the so-called interoperability. Now we work on standards and the more standards evolve, the less you have to work on interoperability, because the more it's pretty clear, right? It's like new phone. So you make it work with the networks. Fine, if that works. Yeah, of course, you also do your tests, but the amount of testing gets less and less. Now, the race environment is particular because there is particular batteries. And it's also the batteries and how they charge, it shows a different behaviour than the battery of a normal car. So usually for that context, the C-rates can potentially be higher, not that we pre-charge the car at higher rates, but the ability is different. The communication of the battery back to the car, or to the race cockpit, for the race engineer, so that that is also different. So there's a lot of particularities you need to look at not so much on the hardware, but purely on the software side. And for us, of course, it's important to understand those, incorporate those, adapt on the software to make sure this is working properly and to support the teams because, yeah, the last thing we want is to let the team down by not being able to charge.

AR: Do you sort of, as a business, do you have to like embrace the risk? Because clearly there's an element of risk. You're quite exposed, it's quite a public environment, it's a

world championship. You know, if you're a supplier to that championship, and things go wrong, it can look bad for a business. So how do you how do you manage that?

FM: Yeah, it's always a chance and a risk, right? Now, I'm not saying that we want something to go wrong, but everything is, is very tight. And so things might go wrong. And so then we have to deal with it. But we will also learn from it. And I think that this learning is, is very important, because what you learn there, you can then carry over into real life. I mean, when we have here, situations where within a few minutes, the car has to be charged up between the races, for example, and then something doesn't work and the communication might have an issue because they introduced a new software on the car and doesn't really speak the language anymore, then we have to adapt very fast on the spot.

AR: Now, that's interesting. So each of the teams might be providing their own software solutions for power management and energy efficiency. But your charger, this charger has to work with all of those, and that can be eleven different solutions, potentially.

FM: Yeah, potentially, of course, that's not what we catered for, right. I mean, this is what I said earlier, we want to really go based on and charge based on the standards. So it was also clear requirement we put out, that we use the CCS charging standard. So in order to be very close to series production, and to be very close to, series software, which we have developed. So if we would have bespoke software for each team, I think that wouldn't work. But the thing is, still, as you rightfully say, every team has its own powertrain and manages its powertrain. So we have to make sure of course, there might be repercussions from the powertrain via the battery, which might cause some communication issues. It's always a risk.

AR: And you mentioned earlier the learning that you've taken on a championship to apply it back to, even like the road car business or the non-racing activities. How does that really work? Do you find you get accelerated learning from being in this environment?

FM: Yeah, sure. I mean, what we have here…let's look at the particularities. I mean, the one is surely the speed of interaction. The other is when you design the charger, you designed the charger to be at a fixed spot. So it's installed. It's screwed to the ground or to the wall or whatever the foundation and it's sitting there. There's also mobile chargers, but this is mobile chargers more for garages, actually, I mean for repair garages for dealerships so they can move around a bit. But it's still then in the same building. And it's a protected environment. What we talk about here is we, we talk about the charger, which is on- and off-loaded, is hopping on planes travelling the globe in different climate conditions, is thrown around like the boxes. And so you need to make that very robust so that, that it really can travel the world flawlessly. And then so of course, then it's also on wheels.
The other thing is then the inputs can also vary: usually you connect it, you commission it, you have a certain grid input in terms of what you get on the voltage level, on ripple, as well. And that can really differ as well here from race to race, because the situation of what you get as an input in Hyderabad in India might be really different than what you get in Portland in Oregon, or what you get in London.
I mean, it-really also sounds like manageable, but it's things we also need to watch out for. So it's kind of this, in this makes the product unique, so that it really needs to be able to be robust and travel and cater to different environmental and input conditions. And then you have the situation to charge two cars. But that is again, that is pretty standard.

AR: And just to give our listeners a picture, the charger that we're talking about, it's quite large, it's not like something you would put in your pocket. It's like a meter-plus tall. And it's about two meters wide. So it's quite a physically big object that is being transported. So it's a substantial device, isn't it?

FM: Yeah, absolutely, absolutely. It's still, I mean, it's large, but looking at the power level you're having, you have 160 kW. And for 160 kW, yeah, a meter tall and a meter wide, as a cubo, is actually not that big for 160 kilowatt, which also makes it, I think, the most compact charger for 160 kilowatt, which is even out there on the market. So that compact design is also key, because when you look at our 360, so charger for the open public space, you design differently, because you want to have that visible from the distance, so you make it quite tall. So even if the upper space might be empty, but still you make it tall to be visible, right. And so you really have to cut it down. But then if you cut it down to the meter in height, that's again a different story. Because then you need to look again, at the, let's say, at the heat dissipation you have inside the product, how do you get the heat out? How's the airflow going through that product, etc.

AR: And obviously, something that is manageable and relatively compact is very important in a racing environment. So it takes up less space, it's easier to frame all these design challenges that you've alluded to.
So another point that's interesting is that while we've spoken a bit about racing, this obviously fits into the whole electrification strategy for ABB E-mobility, so this is part of a much bigger e-mobility story for you. So perhaps you could tell us about where you are with this sort of EV transition that we're all experiencing and how that's fitting in with your business.

FM: Yeah, I mean, the EV transition is in full swing. So we talk about, let's say higher rates of EV penetration year over year, you find different sorts of studies. So we also have a couple of studies, which we look at, I mean, they're all different. But what they have all in common is that they all show massive growth over the next decade in e-mobility. So it's not so much a question on whether this market will take off. It's more a question how fast will it go? And is there anything even out there to derail it? So, and we have in our business now we have growth rates since 2017 of about 64% compound annual growth. So every year on average 64%. That's something you need to manage, right? So if you have that over five, six years year over year, I think we managed quite well. We have grown our business significantly. We brought also new production online. We have opened last year a huge state-of-the-art facility in Italy, San Giovanni Valdarno in Tuscany. So we tripled our output there. Again, we now start in Q1 2023, a manufacturing site in Columbia, South Carolina, United States. So to cover that demand and to comply with, again, with local regulations there. So we also worked with manufacturing partners in Eastern Europe. And we also increased our capabilities in China for the Chinese market, as well. So we're growing everywhere, also our back end. So we really coping with that. At the same time, we will look at our portfolio. And we will launch a new charger for residential and multi-family in the United States at CES in early January. Then we just launched our Terra 360, our flagship charger over Europe. We'll also bring that later on to the United States as well. This gets a really good market acceptance, because it's really kind of state-of-the-art. So I think overall, yeah, we are in a growing market. We invest heavily to be on par with that growth and, managed to flip that into revenues. And at the same time we continue with our portfolio development.

AR: You mentioned when we started just before we were talking before we started the recording that you spent some of your career in China. And you saw this, what you might call the sort of e-mobility birth signs, in the early 2000s. So I thought it was very interesting. Perhaps you could just take us back to what you saw then.

FM: Yeah, sure. sure. Yeah, back then I was working in the automotive industry. So for Bosch on the supply side. And, and we doing all sorts of things, but not e-mobility back then. But what was very common, and it was 2004 to 2008 when I was living in China in a very nice city, close to Shanghai called Suzhou – the Venice of the East. And lots of Chinese cities already back then said we don't want to have combustion-driven two-wheelers. So back then they really changed the whole fleet into E-scooters, actually, which the Chinese sometimes said it's the 'silent death' because you don't hear them.
So the downside back then was I mean the batteries were still lead-acid batteries so not really ideal. But the trend was clear, you had a two-wheeler – silent, clean in terms of emissions on the spot, and very convenient also to charge so that was kind of the starting point, 2004-2008. So we saw that then coming into I think these type of scooters in Europe they started like 2010, something in that range, 2011. Then also there was the phase when the first 'ped-elecs' started – so the bikes, the first e-bikes. And the whole industry, to bring that into cars, yeah, there were some early prototypes in 2008 and so on, but 2010 is where it slowly started where Nissan came up with its Leaf and so you were talking about, yeah, a 50-kilowatt charger being an ultra-fast charger, right, back then.

AR: Can you believe how fast things have progressed or from your perspective, right inside it, was it obvious that things were going to move this fast?

FM: Hindsight is always easy, right? If you're if you're at the point I mean, going back to the China experience, when you sit there in China and you see a whole fleet of millions of E-scooters based on lead-acid batteries and they charge on a socket outlet somewhere you don't really think that this is something which will flip into cars soon. So it takes some, some leapfrogging technologies to do that. And I think one of the key technologies, for sure is all around the battery. So to come up with a high-density lithium-ion battery, which can carry that energy to bring a car a few hundred kilometres. And efficient powertrains, of course, and then yeah, the charging technology and alongside with the charging technology, the communication with the car. I think you needed to be very visionary in 2004 probably to see the stage where we're now in 2022. So if I think if someone would have told me in 2004, 12, 15, 16 years down the road, you will drive electric, your car will have a reach of almost 400 kilometers, you can recharge your car in like 20 minutes on a high-power charger, 350-kilowatt at a, whatever, at an Ionity station, and then you just continue and these stations are all across Europe or similar networks in the US. And I said yeah, 'dream on' and probably would have said this. And you need to be very visionary to envision exactly that. Now, when we sit here now and we talk about that being the technology, which is the standard right now, then, of course the question is where are we in the next 15 years? Where will that go?

AR: That was actually going to be my next question. Because do you feel we're still accelerating at that pace? Is there still a large element of education that's needed, if you like, or learning, so that people feel comfortable to make the change to EV. Are we still in that phase?

FM: I think it's getting better. So trust level in EVs is getting higher so people trust more in the EVs, they trust more in the range. But if you're non-EV drivers, what keeps them away from driving an EV, it's still that. One is still the cars are not as affordable. So we're still not at parity and secondly, is the trust in the technology, particularly in the charging. So yeah, I want to go on vacation, I want to go skiing vacation and it's getting cold and can I really charge and everybody is charging at the same place, so I have to line up, which of course is not ideal if that happens. But this is still the largest barriers actually. So it's the experience as a user, and even if you're passionate EV driver like myself, usually it works flawlessly – but usually is not every time and there is enough occasions--"Damn it!" So again, something doesn't work.
It's not necessarily the charger itself, and I'm not talking about ABB chargers. I'm talking about the industry right now. But it's whatever… your app doesn't work or you get to a charger because you're in a different city and you need to charge but now there is none of the chargers you're signed up to, so you need to download another app and give your credit card details just to be able to charge. Or there's a credit card reader and okay, you want to do that but then this credit card reader accepts a tap only and then your tap function doesn't work. It's all that sort of particularities. So I think the industry has to still take a long way to create more a user-friendly standard. I mean from our side, from ABB E-mobility, we're there to help to drive, but of course we also dependent on what our customers want from us. And you cannot imagine how different variations are.
And then I think a much bigger point, which is not so visible to the consumers usually, is the availability of power on the sites. Because when you came up with this example of skiing holiday, right. So if you're around these weekends of, whatever, carnival season in Europe, and so everybody wants to go skiing, so the roads are usually jammed. And now your range goes down in winter of the battery. So if you want you go to a ski resort, I think you have the tendency to not go there with a depleted battery and then find the place or you want to have a certain state of charge when you get there and to get away, as well and in winter. And so there's queuing at the charging stations. What you need to get to is, is places where you do not have like four stalls, or six stalls, places where you have 24 stalls or 48 stalls or whatever. And that's, of course, huge investments. But besides of that, it's also huge power requirements. And you need to bring that power to the site. And that is discussions with utilities, then you have to do with permitting, with planning. And these planning cycles, our customers go through, they don't talk about weeks or months, they talk about years.

AR: Is this why governments have a role to play in these big infrastructure questions? Is that really where you need a concerted government-level involvement, if you like, to say: look, we're going to, if you take the Chinese example and things that have happened in the US recently, you've had major government investments to drive EV progress. Is that kind of what's needed?

FM: That is for sure helpful. It's always, you need a certain push, if you want to come out with a technology change. You need some push and some help. And governments can help. And what's happening in the US right now, the huge funding I mean, the IRA Inflation Reduction Act that really pumps tremendous amount of money into the green industry in general, which is great. Now, with the inflation Reduction Act, they actually get at the forefront. And now we're at a situation where the European Union is even complaining, or it's probably too much and too much of too much subsidy. How do we react now? Yeah. So I think the right way to react is creating a positive environment; it's not coming up with

rules or whatever, but is really getting out there and saying: 'Look, yeah, we also support and fund a transition to Green Energy.' So this is where they can help.

AR: I guess your point that perhaps that you're alluding to is fostering an atmosphere for innovation and new developments. And really, that brings us back to what we see here in ABB Formula E, this constant stream of innovation. So perhaps this is a good example for-- a slightly strange one, a slightly extreme one-- but a good example of how innovation can take place in this market.

FM: Absolutely.

AR: And do you think the electrification we see in ABB Formula E is simply an inevitability for road transport and motorised transport?

FM: Absolutely. I mean, it's amazing, looking at this Gen3 car now compared with the eight seasons before. It's a big step. Again, they managed to reduce the size and the weight of the battery significantly, whilst at the same time increasing the range That's fantastic. That is innovation. Increasing the acceleration. Getting a different kind of noise level from the car. So if you look at that, I think that is innovation the car manufacturers can really fast-track innovation, use it as a test-lab, as we always say, and the same for us in the charging. We are never at the end of the story, it really continues.

AR: And what better way to check in on that never-ending story than by following ABB Formula E throughout Season 9, which starts with the Mexican E-Prix on January 14.

ABB will be covering the season on its social media channels throughout the year and you can also find the latest championship news on new.ABB.com – which is also a window into the wide world of ABB.
That brings this episode of ABB Decoded to a close – but if you've enjoyed the conversation, don't forget to like, share and subscribe, wherever you get your podcasts.

Until next time…