# Podcast Transcript: How Software Intelligence is Driving Safer, Sustainable Battery Management

[00:00:11] **Jeff:** Hello everyone. Thanks for tuning in to yet another episode of The Counterpoint Podcast. I'm your host, Jeff Fieldhack, and we have a special guest joining us today from a company called Qnovo that develops intelligent Lithium Ion battery management software to improve battery performance, mainly in electric vehicles, but also in other technology verticals. Please welcome Dr Nadim Maloof, CEO of Qnovo. Hello, Nadim.

[00:00:42] **Nadim:** Good morning Jeff, and thank you for having me on the program this morning.

[00:00:45] **Jeff:** Yeah, it's great to have you. And before we begin the podcast, please give our listeners a brief overview of both your background and your company's background.

[00:00:56] **Nadim:** Well, thank you. And good morning to everyone. By training. I'm an electrical engineer. I have a degree in electrical engineering from Stanford, many years back. And I've sort of since moved on to managing companies and living in Silicon Valley, I've always been inspired by in the Valley. And so k novo is the fruit of that many years of living here and being inspired by many great inventors, entrepreneurs, and companies in the valley.

So Qnovo was started about roughly 12 years ago, and the emphasis at the time was, how can we make batteries better? And if you go back to 2010 timeframe, everybody knew that batteries, electric vehicles were gonna be on the horizon. The iPhone that's just been launched a couple of years. And people were worried about the batteries, and batteries was on everyone's mind.

And yet we knew that making batteries was gonna be hard and better left perhaps to the manufacturing prowess of Asia, in particular China. And so that led us down the path of what can we do to add more intelligence to the battery? And that was the genesis of the company.

[00:02:00] **Jeff:** That's super interesting, especially as we're in the midst of EV growth. So let's begin on the automotive side. Our data at

Counterpoint research shows EV sales passed 10 million units last year and is on a growth trajectory of 65% year over year. The China market is leading this growth. So looking broadly at these numbers, what do you see as the biggest growth driver right now within the EV space?

[00:02:32] **Nadim:** So we love EVs. That's sort of been coming for a decade, but they're also difficult to make. EVs are not simple. The batteries are complex. The vehicles are complex. The ecosystem run is complex, but we love them because that is the future that we're driving down the path. Globally. So number one, for, for perhaps two decades, we've had environments dictated by governments, regulatory environments in Europe, incentives in Asia.

China certainly has put tremendous amount of effort into promoting EVs and also leapfrogging. If you go back, China did not participate in the combustion engine vehicles. So they felt that they had to leapfrog combustion engines and participate in the next automotive wave, which is electric vehicles. So you've got first and foremost government regulatory environments and incentives.

Second is an increased awareness in the climate. So you're seeing more and more people sort of saying, wait a second, tornadoes, if you look at California's weather, this past winter, unheard of in a hundred years between the snow and the storms. So people are beginning to be more aware about. Can we do something?

Should we do something about the weather? And how can we electrify and move towards a decarbonized economy? Increasingly, you see utilities that are saying we need to move away from carbon-emitting power plants into power that is essentially clean and green, and that's where the batteries come in. So you've got macroeconomic forces that are driving electrification. At the same time, the technology has evolved. Electrification is not new. If you go back to the eighties, GM had the first EV one, if you remember that in the pictures andyou can Google that, and that was running on lead acid batteries. So the technology back in the 80’s wasn't really up to par. To what the expectation of drivers should be today.

And so you had lithium ion batteries that have evolved substantially, both from a performance standpoint as well as a cost perspective that made

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EVs effectively affordable. So you got a confluence of technology improvements, governments pushing it, and that was the seed, so to speak, that gut EVs to proliferate.

However, I wanna caution everyone not to just rest on our lawns because we have a lot of work that needs to be done. We've only scratched the surface today. The next question is how do we take that to the next level of adoption and accelerate adoption globally, not only in a few affluent localities.

[00:05:00] **Jeff:** Interesting. And let's, let's talk about your expertise on the battery front. It's a very important component, obviously for electric vehicles. So can you break down for our listeners the various facets of battery performance and any comments on where we are along this curve?

[00:05:22] **Nadim:** Indeed battery is a hot topic these days. If you go around, there's one in your iPhone, in your Android phone, in your in your computer, multiple in your computer, and increasingly in the car. And we all now expect a certain performance level. And that performance level, first and foremost, is dictated by the user experience. So let's talk about the vehicles.

If I hop in my EV, I expect a certain driving range and a certain charging speed that mimics and replicates my experience when I was driving a gasoline driven engine. So what does it really mean? First and foremost, a range of roughly 300 to 400 miles. I think we're there. Most EVs today are getting close, if not exceeding, they're getting close to that number of roughly three to 400 miles of range. But what's missing is the charging.

Either the charging infrastructure is lacking or where it does exist, it is not fast enough, so we need to go charge and wait for half an hour, 45 minutes, or often even more to charge the vehicle. And that is not a user experience that's friendly to adoption of EVs, and that is changing. We are changing that.

The next one is the question of longevity. You know, we're all used now to having cars that can last 12, 15, 20 years on the road. Depending on the geography in the country or globally. And so the question is, will EVs last as long? And the answer is yes. Today we can be at a point along with technologies like ours and, and many others that can get to longevity

of the battery to last 200,000, 300,000, 400,000 miles over the next decade or two. And so that's sort of the user experience is number one.

The second one that cannot be forgotten is the cost curve. Batteries need to continue to go down on a cost curve to make EVs affordable. And you've seen Tesla beginning to launch that first wave of, I'm gonna say, in quotation, “affordable vehicles”. They're not yet affordable in the sense that combustion engines are, but certainly relative to the first wave of EVs, they're relatively more affordable.

And along the last point I wanna make here is one of safety. You know, you everybody remembers the GM Bolt recall last year, the Hyundai recalls, and that cannot repeat itself in the future.

[00:07:38] **Jeff:** There's lots of easy interest in fleet management, taxis, delivery trucks, and this is requiring quicker charging times. Where are we at and what's happening on this front?

[00:07:55] **Nadim:** So Europe has been certainly extremely aggressive on electrifying all aspects of transportation, including heavy duty trucks, class eight vehicles that transport freights across countries and, geographies. The US has now joined that bandwagon. Certainly Asia is, but the US EPA just announced recently, just a few weeks ago that by 2035, a substantial portion, if not all the vehicles in the US that are heavyweight for freight vehicles, class eight and what have you, would also be zero emissions. And zero emissions. Could, mean electrified or fuel cells.

Now you look at electric trucks today. They're massive. You see Tesla, you see Volvo, you see down trucks, some of the big brands that are all launching those massive Class eight semi-trucks, and they have batteries that are enormous. Let me give you some numbers. 500 kilowatt hours to a megawatt hours. Now, it may not resonate with the average listener, but 500 kilowatt hours will power a block, a whole city block for a week.

That's a huge amount of energy. And so to charge these things, you cannot just take it down the street to the high school where you have a little plugin and there and then charge 'em. That would take probably a week to charge the thing.

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They now have slowly building out depots, charging depots, and the most recent announcement came from Daimler just a few weeks last week as a matter of fact, and they announced the first one megawatt charger.

So that's one megawatt of charging power to effectively charge a semi-truck in, in under an hour, 45 minutes or so. And that makes it conducive to commercialization of fleets. Now, naturally, that's on one end of the spectrum. Fleets are not always big, heavy trucks. Fleets also include taxis. Taxis in cities, and these are more closer to sedan cars or perhaps SUVs.

So more in line of the vehicles that we've been accustomed to see on the road for

[00:09:46] **Jeff:** For EVs, the charging infrastructure is also equally important, and we're seeing initiatives both in the US and elsewhere to address these problems. It's a very slow build and it will obviously take time and more investment. What do you see as the fix short term for these problems?

[00:10:08] **Nadim:** The charging experience is equally important to driving range in the vehicle. When you hop in the car, you need to know that you don't have that anxiety. We call anxiety for a specific reason because we're nervous about will we have the opportunity to charge.

And YouTube is absolutely filled with videos that tell you that they're down to the last two miles of range on the vehicle and they can't find the charging station. So when we talk about charging, we talk about two things. One, availability of the infrastructure. Is there a charger within say, five miles of driving range of me or perhaps less?

And the second question is, how fast can I charge? Am I gonna sit there for two hours to charge? And one of them relates to infrastructure, the other one relates to the vehicle itself. Let me address that.

Infrastructure is slowly being built up. And so you see today a, a fairly large number, at least in the United States, a fairly large number of, what's called Level two chargers. These are roughly 11 to 20 kilowatts of charger. They will charge your battery slowly, typically full tank, and maybe about four or five hours. With infrastructure, you're talking about a level two chargers. These are roughly 11 to 20 kilowatt chargers, and they're fairly ubiquitous across the United States.

You'll find 'em in shopping centers. You'll find 'em perhaps in schools and in the offices, and they're slow charges. They'll charge a vehicle full tank in roughly call it four or five hours. That's fine for commuters. You can charge overnight at home. You can charge in the office. It is not fine for those who are saying, I want to take a trip from point A to point B, and that's a long distance.

I don't have a lot of time. And increasingly it is not fine for dense urban areas. So let's say you live in Manhattan. And real estate is expensive. Therefore, putting charging stations in a, in a dense urban area like Manhattan means that you need to find the real estate to put those charging stations, and therefore you need to charge for the space itself.

And therefore you gotta have fast charging when you come in into a charging station in a dense, urban area. There has to be the ability of really putting that charge in the vehicle in the fastest possible time. And today we routinely charge a vehicle all else being equal in about 20 minutes. So full tank in about 20 minutes.

So this begins to replicate the experience of a gas station where you can go in and fill up a gas tank in say, 10 minutes or less. And so increasingly, we're now seeing networks in America called Electrify America Tesla's network that are putting those very fast, high power charging stations. So we're going on from level two, which is, as I said, 10 to 20 kilowatts of charging, to 250 kilowatts of charging or even 350 kilowatts of charging.

That's a large amount of power, but that's sufficient to charge the vehicle in about 20 minutes. So two things. The charging infrastructure that's probably gonna take years before it's ubiquitous across the country. Increasingly, we see it now on major highway corridors and in some dense urban areas.

But it's gonna take a while before you start seeing it on, say, I 80 in the middle of Nevada, perhaps in a desert. And increasingly we're seeing more cars or car makers that are saying the vehicle will be able to accept that charge. The silliest thing to do is to take your car to a fast charging station, but the car cannot accept that charge because it may damage the battery.

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And that's kinda what we do at Qnovo. We enable the vehicles to take that charge at the highest possible charge rate. Without damaging the battery.

[00:13:38] **Jeff:** Here's a very kind of open-ended question. Tesla had its investors' day recently, accelerating growth. You're tracking EV players, are there any new implementations you are seeing by the EV players that could accelerate adoption?

[00:13:56] **Nadim:** Absolutely. So I think you're, you're seeing a whole new crop of vehicles that will be on the market saying late 24, 25 models that will begin to replicate the user experience of combustion engines and, and a relatively affordable price. I'm gonna say relatively, it's not gonna be $20,000, but sort of call it a, not a super luxury, but a medium range cost in a 40 to 50k US dollars. And these are vehicles that will give the, the driver 400 miles of range approximately charge in under 30 minutes, and provide longevity that will exceed that 10 years or 12 years of warranty. And so now you're seeing vehicles that begin to feel like a real vehicle the way we've been accustomed to driving cars for the last 50 years.

And the price point that is relatively attractive along with the incentives. You know, the US government offers a very generous incentive today of $7,500, and that really is gonna make that tipping point in that 20 24, 25 timeframe where you're gonna see people saying, Hey, I'm ready to buy an EV today.

Most people I talk to, the question comes up, Hey, I would love to buy an EV, but I don't think I find a vehicle other than Tesla that meets my demands. When do you think those cars will be on the market? And I often say be patient, but we're very, we're really close. One year to two years max would see those models on the road.

[00:15:24] **Jeff:** So beyond the EV industry, where else can we see car Qnovo's technologies popping up?

[00:15:30] **Nadim:** Yeah, I wanna, I wanna address the fast charging infrastructure from a yet another angle. So let's say you're in Manhattan or a dense urban area and you wanna put a fast charging station, 350 kilowatts, or perhaps a depot for charging, heavy duty trucks. You don't go to the utility and say, please drop me a megawatt line. A megawatt line is, is a whole city blocks worth of power. So how do you do that? And

increasingly, one of the approaches that are being taken is to put what's called stationary energy storage. So these are containers that would contain thousands of individual batteries.

And sufficient to provide that one megawatt of power or whatever, some huge amount of power for that short period of time to charge the vehicles rapidly. And so in essence, you can charge those batteries, those tanks, so to speak, electric tanks overnight, and then in the daytime, When you have the demand to charge vehicles fast, they have the power locally in that container.

It could be sitting at a gas station, it could be sitting underground, perhaps in a building or office building, and provide that capability. So now you see a convergence of two industries, transportation, which is fast-charging vehicles, but also the electric utility network in the form of those. Tanks, those storage units, what's called ESS, which is Energy Storage Systems, and they're much bigger than a vehicle.

We're talking about megawatt hours of energy that's being stored in those tanks. But that is the buffer to provide the energy, and that's where we see tremendous demand for solutions like ours. Because you need safety, you need longevity. And also as we provide, Those customers, tremendous insights into what is the health of the battery.

These are systems that are heavy, big, expensive, and so when you deploy them in the field that it's a form of a gas station or or in a parking lot. There has to be for the operators, the mechanism to monitor its health and its safety and do it online constantly. And that's again what we help our customers.

[00:17:32] **Jeff:** Interesting. Thank you. Maybe one final question that the EV space is where all the growth is. However, we're Counterpoint. We love smartphones. We understand there's a 150 million smartphones in the market with your technology. Any comments how you're seeing things progressing within the smartphone space?

[00:17:54] **Nadim:** One thing that we're super proud of is our relationship with Docomo in Japan. Docomo is one of the most premier carriers sort of like the AT&T of Japan or the Verizon of Japan. And we just launched with them just recently, about three months back. The first phone, the first smartphone on the Docomo network that provides its users four years of battery warranty, four years.

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So you buy the phone and most likely the battery may outlast the phone. And that's important both from a user experience and second, from a sustainability perspective. The user experience is important because when you buy the phone, we never asked a question about is the CPU gonna ask me? That is not a question anyone asks, but they're always saying, will the battery last me?

Will the battery be there in a year or two? And that essentially with a four-year battery warranty, you take that anxiety away from the user's perspective or the experience. As well as sustainability. I mean, today we've got 1.5, 1.6 billion smartphones that are being produced every year, and those batteries last on average one year, so that's 1.6 billion batteries every year in smartphones that go into landfills.

So if you can that by a factor of four, that is significant improvements in terms of sustainability and reducing the stuff that we throw in the landfill.

[00:19:15] **Jeff:** That is super interesting and sustainability is such a hot topic, so that, yeah, great news. And we look forward to continuing to watch this space. So thank you very much for taking the time to chat with us today. Thank you.

[00:19:29] **Nadim:** Yeah, thank you for having me,

[00:19:32] **Jeff:** Jeff. And for all our listeners, thanks for tuning in. As always, you can listen to our previous podcast on counterpointresearch.com and your favorite podcasting platforms. For now, this is Jeff signing off, and we'll talk to you again soon. Thank you very much for joining.

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