PODCAST

Making the world’s greenest battery

ABB Decoded

Northvolt founder and CEO Peter Carlsson tells how Northvolt aims to revolutionize global battery manufacture, from a European base.

Anthony Rowlinson

Hello and welcome to ABB Decoded, the podcast that tries to press pause on our fast moving lives, and to 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 Peter Carlsson, the founder and CEO of Northvolt, an ambitious Swedish startup that's aiming to revolutionize large-scale battery manufacture in Europe.

With a background at Tesla and Sony Ericsson, Carlsson is well-placed to understand the difficulty of disrupting an established industry, particularly at a time of intense global demand as the world shifts from an economy based on fossil fuels to one that uses more sustainable sources of energy. And he explains how supply chain difficulties, together with the necessity of finding the most talented staff to work for a growing business, represent a constant challenge. But with challenge comes opportunity and for Carlsson that opportunity is to make Northvolt a world leader in sustainable battery technology.

And this is how he plans to do it.

Peter Carlsson:

So, my name is Peter Carlsson. I'm the founder and CEO of Northvolt. And Northvolt was born in 2016. I've just left Tesla after a number of years, building up operations and supply chains at Tesla. Among the last things I was engaged with was setting up the Gigafactory in Reno, Nevada. And it was born out of what we saw was a very clear need. We saw Europe basically committing to the Paris Treaty that really needed to reduce CO2 carbon footprint with roughly 80% over three decades.

In order to do that-it basically needs to overhaul all transportation into electrification and also a massive change in power generation, removing coal, oil, gas, and replace it with renewable. And the common nominator in these changes is a very big need of storing

energy and where batteries are really playing a large role. So, we saw this very, very large demand in order, if we should achieve our, objectives and almost non-existing supply chain.

So, that was kind of the starting point, which we basically put together a concept study. We, in the beginning, we called it SGF, the Swedish Gigafactory, or as Paolo, my co-founder, used to say, the Swedish Girlfriend. But, a year into this, we recognized a couple of things. And part of that was how fragmented and how energy intensive the whole supply chain of building batteries was. And where we saw an opportunity to basically, kind of, change a little bit the rules of the game. If you do a vertical integration of active material making, we saw that your dependency on labor becomes less, we saw that the dependency on energy infrastructure, and being in, in a really good energy grid becomes really, relatively, significantly more important. Then this is particularly valid when you do things at large scale.

So, that was the assumption that we did. And the other thing, we saw was that the carbon footprint of this value chain, from raw materials into finished was pretty damn big. (laughs)

Establishing new factories at large scale in grids that have the access to full renewable energy, such as our plant up in northern Sweden, would dramatically reduce that carbon footprint. And the combination there really made it worthwhile to pursue. And the beginning of 2017, we then went out and launched Northvolt as an ambition to build a European champion.

Anthony:

You touched on many points there. Thanks for that great overview. But for listeners who might not know the Northvolt name yet, obviously it's a growing business with big ambitions, but could you tell us a couple of things about what's unique and special about the company? For example, the geographical location and the idea of a sustainable grid to support your manufacturing.

Peter:

Yeah. Well, what is unique with the company is that we are very clearly aimed to build the world's greenest battery; to take the carbon footprint of our products as close to zero as possible. The reason why we started the company is that we're really trying to solve a big problem, and that is the global problem of global warming and the increasing amount of carbons in the atmosphere.

So, by really driving products that is as carbon-neutral as possible, became a really, really, a big-mission. Then, we also saw that besides that we recognized that actually being a European player, working with, you know, a fair amount of openness, bringing really great people into the company, there was a big space also in the opportunity of doing much, much better co-developments with our customers.

And the reason why I'm saying that is, five years ago, most of the customers were seeing batteries as kind of a commodity. You would buy standardized formats. It was pretty much similar type of products for everyone. And you'd build the electrification upon it. Today you're seeing, as big car companies are now transforming into fully electric, you're starting to see where their aspirations that they had on brand and product performance and product characteristics is now being moved into that electrification.

And a battery is, it's a chemical system (laughs) that can be optimized, uh, towards different features. You know, you could have enhancement on power in order to get the best

acceleration. You could have an optimization towards energy density so that you get the most range. You can optimize it towards, you know, more heavy duty, many cycles. And the ability to co-develop with our customers so that they could set the optimal chemical systems towards their needs was clearly a big additionality towards our full sustainability focus.

Anthony:

So, move away from, like, a standardized product, if you like, to a much more custom solution.

Peter:

That, that is absolutely something that we're seeing. And we're also seeing that batteries become more and more integral parts of product designs. Whether it's vehicles where the batteries becomes a structural part of, of the vehicle body. But it's also where other equipment makers, you know, electric bikes, you have different types of industry applications where the integration of the product and the seamless performance becomes really, really important.

Anthony:

Thank you. Could you explain why the e-mobility transition is so heavily dependent on battery manufacturing? Because the cars are, the technology is, ready to make a great EV now. Many, many factories can do it. But it's almost as if there is too much demand for the battery supply. And it, it could even be a bottleneck, if you like, in that transition happening.

Peter:

Yes. that's, that's the case already. When we are electrifying transportation the demand increase on batteries are just going through the roof. As a little bit of a reference point, back in the days at Tesla in 2014 or so, we saw that if we bring in batteries in electrification into one product, a mid-size but, but fairly big volume, we would consume all the world's battery production that had been primarily focused on consumer electronics and these types of applications.

So basically with building the Gigafactory in Reno, we almost doubled the world production at that point of time. Now, if you look last year, for example, I think the world produced roughly 250 gigawatt-hours, which is almost a tenfold from where we are, were 2013, 2014. And when we look in 2030, we're probably looking at something like 3,000 gigawatt-hours. So, we see this, this enormous exponential growth by this market. And when you're seeing so big growth in an industry that is so physical (laughs) you also see a number of challenges.

One being that building these, factories at really large scale, have not been done in the amounts that we are now seeing, which is putting a lot of stress on key competence to build these products, the suppliers to provide the equipment to do all of this. So, it's a very stressed supply chain where everybody, is kind of chasing to expand. And that's only the battery factories. Then, you have the entire kind of supply chain of key components, raw materials, etc., that needs to follow.

So, I think we are really looking at perhaps a decade of different types of constraints as these capacities are being expanded, which obviously is a great opportunity for us as a company. Our ability to succeed with our plans is going to be very much driven by our

ability to attract continuous top talent and we've been really good with that so far, but this needs to continue.

Our ability to attract capital. The capital part, it's, you know, this is almost like semiconductor industry, very capital intensive to build up these factories. And the ability to build a scalable footprint. In this industry, to be able to do almost what Ikea have been doing on scaling their warehouses. This is a little bit more difficult to do, but these three factors will be very important in enabling long-term success.

Anthony:

So, you've been very clear about the vision, if you like. And also the challenges of taking a concept from startup to scale. But where are you on that development curve?

Peter:

We are right now in the scale-up phase. We have built up the first phase of our factory up to 16 gigawatt-hours. And as a reference point, 16 gigawatt-hours would support somewhere in 200 to 300,000 vehicles on an annual basis with batteries.

This is now under ramp-up. There is a lot of process steps in battery manufacturing, almost, you know, 15 different process steps. And, you know, we're tuning this on line by line, and making sure that we're getting both the quality and ramping up the yields, etc. So, it's a fairly long process to get these factories up to an optimal yield and efficiency level. So, we're in the beginning of this with the first 16 gigawatt-hours.

In parallel, we have also built a battery systems division. So, not just cell manufacturing, but we're also taking these cells and we're building industry applications towards, you know, underground mining, towards material handling, towards construction. So fairly heavy-duty industrial systems. And we're doing that in Poland, in Gdansk, where we have a facility, and we're building a second factory right now in Poland.

The third leg is on energy storage. On the energy storage side I think we are just in the very, very early beginning of how we build in energy storage into our infrastructure to balance and to, particularly handling peak loads, which will be much more challenging to deal with when we're phasing out, you know, sources of continuous power, such as coal and gas, and we're bringing on a more flexible energy sources, such as wind and solar.

And we see a tremendous growth in that market. Maybe North America is growing the fastest. But as more and more countries are both deregulating their energy market and investing into this new types of grids, the need for storage, is just going to increase. So, that's the third leg on which we are developing and scaling up products.

Anthony:

Now, you've mentioned that a key part of your philosophy, if you like, is to do this in Europe. Does that present challenges or opportunities, or a combination of both?

Peter:

It represents a combination of both. One part of, you know, some of the challenges in Europe is that you need to create a core base of competence. You know, there is basic research in Europe around batteries, etc. that is really, really good. But this industry have evolved, you know, it started in Japan, moved to Korea and then it really scaled in China. And so, the supply chains, a lot of the competence and the skills have been developed there. So, there is a competence challenge in general.

There is also the fact that Europe has higher standards when it comes to how we build factories. It has higher regulations around material handling, the reach, etc. So, it is even more capital intensive to build these factories in Europe with its regulation compared to in some other areas.

So, these are some of the challenges. The opportunities is, you know, number one, there is a strong sense in Europe that we need to do it. There is a strong commitment to the Paris Treaty and there is also a very strong understanding. It's like, let's do it, and let's do it right. Because if we would transition the entire car industry with batteries, with the type of footprint that most batteries have today, we would create a new carbon footprint the size of half Germany's carbon footprint in that transition, which would defy, really some of the big purposes (laughing) on why we're doing this-

Anthony:

Is that from the scale of the manufacturing process that you'd need, and the minerals and the resources that you'd need?

Peter:

It is. When you look at scaling up these processes and some of the energy intensive, manufacturing that is both in the supply chain, on how you process raw material, like, you know, creating lithium hydroxide, graphite, etc., but also in the manufacturing.

So, the fact that there is in Europe, both a strong sense we need to do it, I would say that the momentum among all stakeholders to do it and to do it right, is really in Europe.

Anthony:

Is that where the European Battery Alliance comes in?

Peter:

It is part of that. I mean, we were part of the first meeting where the European Commission have come to the same realization as we did. Which is there is a missing part, there is an ecosystem around this electrification that needs to be built, and there is a need to coordinate and enable this.

So, the first Battery Alliance meeting, I think it was with 13 companies down in Brussels, and over the last four years, this have grown to over 600 companies now, I think. And have been a key enabler for how to collaborate, how to help, releasing some of the bottlenecks. I mean, in the beginning, it was a lot of focusing around financing. How to allocate the needed resources. Later, it has moved more to the supply chains, the competence challenges and a much broader focus in the alliance.

Anthony:

One of the things that I think's particularly interesting, we touched on this before, but it, the location of your factory in northern Sweden and the sustainable power that you can use to drive it, if you like. Could you tell us a bit more about that?

Peter:

Yeah. When we came to the realization that putting it into the right setup is very, very important to achieve our mission. We launched a site selection process and we asked 20 different municipalities in Finland, I think we asked one or two in Norway, one in Denmark, in areas which we thought had the strategic composition. And out of this basically, we came

to two finalists. One was Skelleftea, where we clearly had a huge energy advantage and we had also a municipality in a region that really wanted to make this happening. And, you know, within the regional network of Skelleftea Energy, which is the big energy provider up there, we have roughly a fourth of Sweden's hydropower in the, the same grid.

And the second-location being Vasteras, where Vasteras had the competence base, you know, one of the founding cities of ABB, or at least from the ASEA area. It has one of the highest concentrations of engineers and stock on Vasteras being a very attractive labor market. And this is a very competence intensive industry, both to develop, but also to industrialize. So, we're standing there and kind of, you know, what do we do? We probably have the best opportunity to create a talent base in Vasteras, but we really have the best energy situation up in Skelleftea.

And then we took a decision, let's do development and industrialization in Vasteras, but really build large scale-up in Skelleftea. And in hindsight, I think that was really the right choice. And what we are now working on is the infrastructure for the sites that is coming after Skelleftea. We have announced one facility in Gothenburg where we are producing. It's a joint venture factory together with Volvo cars.

We have also acquired an old pulp-and-paper mill in Borlange. It's about two hours from Stockholm, where Stora Enso were basically seeing a reduction in usage. So, they were shutting this facility down and what this came really, really handy at the point where we could get a full infrastructure site with 350 megawatts of transmissioned energy. And you have 22 hydroplants in Dalalven next door to it.

So we are right now building the puzzle also to a complete European infrastructure where it's all supported by renewable energy.

Anthony:

And how does your past experience as a Tesla executive and Sony Ericsson, inform what you're doing now?

Peter:

Well, I think both were really, really interesting growth journeys. And it is fascinating to be on growth journeys (laughing). Many times in a day-to-day, it's hard to see the growth from the (laughs), you know, the constant chaos and removing bottlenecks that you're working on. And it's almost like, it's only, you know, at the end of the year, and you're kind of summing up your accomplishments throughout the year that you recognize, "Oh my God, you know, there was quite some achievements."

So, I think it was both educational journeys. On the Tesla side, you know, also, joining the company when it was really, really small. We were roughly 400 people. We were doing a small roadster production with Lotus in the UK. And we wanted to compete with some of these giants, you know, the Fords, and the Volkswagens of the world in what is one of the largest industries. And just the way that you address that, you kind of eat the elephant (laughs) by systematically taking step by step. And all the challenges that comes with that was, I think, for myself, you know, perhaps the best education I could have preparing for this journey.

Anthony:

Can you use the Tesla model as a reference for what's achievable? And if you ever have a moment of doubt, do you sort of think, "well, if that's possible, then this is possible too"?

Peter:

You know, during the Tesla journey there was a lot of moments where you saw all the obstacles and you kind of questioned yourself. You know, will we make it? Will we get through? And you just keep pushing the troops, you know, solving problem by problem, and sometimes it seems like you're just going through a big mud field (laughing). And eventually the ketchup bottle kind of comes out and you surpass that obstacle and you get to the next.

The thing that I feel very, very strongly during the years of Tesla, and that I feel very, very strongly right now was, yes, there is a lot of obstacles, but fundamentally, you know, what we're doing, and the way we're doing it, this is absolutely right. This is the way a battery company, an energy storage company, should be built. And that gives me kind of a strong reassurance (laughing). If we just get our execution and we're solving our bottlenecks, there is an ocean of opportunities for us to become a leader in this field.

Anthony:

And how long do you think it will be before Northvolt batteries are speced by OEMs as their default battery in their production lines?

Peter:

Well one thing that we haven't talked much about is also the recycling part. And part of our overall mission to reduce carbon footprint is also to have an as effective recycling strategy as possible. Our ambition 2030 is to have 50% recycled material going into building new products. And our aspiration is that we will build, you know, a very strong circular economy. And basically, build circular loops with our customers. And at the end of the curve, you know, towards 2040, this will be almost a self-, a self-cycle in, you know, we're building new products out of old products, and we don't need that much raw materials into the process.

And I think the more we can build a zero-carbon proposition and we can build that circular loop and reduce the overall cost for users on battery technology, the more I think we will get into a situation where we are a de facto standard for sustainable energy and energy storage.

Anthony:

And with that goal in mind, we'll bring 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. You can find out more about Northvolt at northvolt.com and explore the world of ABB at new.abb.com.

Until next time.