Voiceover:

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Nikoleta

So welcome everyone to the third episode of the Battery caffè, focusing on market trends for solid state batteries. I'm Nikoleta Piperidou from the Clean Energy and Infrastructure team at KTN hosting today's episode, alongside my colleague, Sheena Hindocha. Hi Sheena.

Sheena

Hi Nikoleta. Hi everyone, it's great to be back. I'm Sheena Hindocha from KTN's Chemistry and Industrial Biotechnology team.

Nikoleta

Thank you. The battery Cafe is an initiative of the Cross-Sector Battery Systems Innovation Network, a community funded by KTN and the Faraday Battery Challenge. So, the Innovation Network aims to open new markets for the battery industry, promote innovation in batteries and help decarbonise a wide range of end-users.

So if you haven't already, please go check out our online platform at ukbatteriesnetwork.org, you'll find lots of useful materials, and our first two episodes on investment in batteries and battery recycling. Today, with us, two very special guests. Adrian Tylim, Head of Business Development Americas at Blue Solutions. Hi Adrian.

Adrian

Hello everybody, Sheena, Nikoleta, thank you for the invitation, it's a pleasure to be with you, John as well. I'm glad we are here together. My name is Adrian Tylim, I am Head of Blue Solutions' Business Development in North America.

Nikoleta

Thank you very much. And also with us today, John Tinson, VP of sales at Ilika. Hi John.

John

Hello again, it's a real pleasure to be here today. Ilika itself is a UK based stock market listed developer of solid state technology. I'm the sales and marketing director of the company with a number of, sort of early stage tech start-ups behind me, but this is my new reincarnation in the battery sector.

Nikoleta

Fantastic. Thank you. And so everyone thank you for listening to us. Make yourself a coffee and join us for this interesting discussion.

So let's start from the beginning, today we're talking about solid state batteries. John, what are solid state batteries and what properties do they have that make them competitive with lithium ion and other batteries?

John

Well clearly, they're hoping to be a bit more than just competitive, but one little misnomer is they're not necessarily fully solid, or at least in the early stages, they are quite likely to contain gel or polymer, or maybe even separate layers so they're not as solid as, as you might fully assume. But the idea behind them is to be up to twice as energy dense as the existing technology.

And, and that of course can be used by the OEM in a number of ways. It could be used as a light weighting method, you could have a battery pack which is simply smaller, or you could have a battery pack which is simply more powerful. But the solid nature of them makes them safe, they use the safe materials, there's no liquid which becomes flammable. And so there's a safety aspect, there's a density aspect, and there is the anticipation although not necessarily fully proven yet of a faster charge rate, and a faster discharge rate. So there's a lot of things to like about solid state in view of electric vehicles, and a lot of high hopes behind them.

Sheena

That's super interesting, thanks John. And I guess that kind of brings us to the key question that everyone really asks around solid state batteries at the moment. Are they commercially viable today and how far are we from market penetration to the level of lithium ion batteries? I don't know Adrian, do you have a perspective on that?

Adrian

Yeah, absolutely. I'm thinking so, Blue Solutions is part of a very large French Group, the Bolloré Group.

And in reality, we have been commercialising battery packs for mobility applications using thousands of electric cars, trucks, buses. And so it's a commercial product that is ready for the market. And in terms of the chemistry itself, in our case, it's based on, first of all, we use plastic extrusion techniques, ultra-thin films, and all of the components of the battery, all the layers are solid okay? So, as in difference to some of the solid state products that may be coming up in the market, ours is totally solid and is made out of dual electrolyte that is solid electrodes as well. So their applications where we are installing them, we have large OEM's like Daimler for example using them in the buses. The first all-electric bus line in Paris uses our commercially available all solid state packs, and there are over 100 buses there and then we have applications all over the world deployed in that cold and hot environments.

Nikoleta

Thank you very much for this overview. And you may recall that Blue Solutions and Ilika, as well as other organisations, recently participated in a two-day UK Canada Solid State Summit in collaboration with The British High Commission in Canada and the Faraday Institution in the UK and the National Research Centre in Canada. And Sheena, I recall at the end of this two-day summit you said "I loved it, wish we could do more about next generation batteries". What is it that fascinates you about next generation batteries and was there a key learning from the summit?

Sheena

Yes I did really enjoy it, I think it's the inorganic chemist in me, I loved hearing about new developments in this space. So, I think it was really interesting how researchers are actually utilizing machine learning, big data analytics to explore new chemistries, materials and structures, and to use that to understand how particle size, crystallinity and conductivity all play a role, where that balance lies, you want performance out of your battery and how do these things impact the performance and where can we make moves forward. And John's also mentioned about polymers and solid state batteries and we actually heard a lot about how new polymers are being developed for use in solid state batteries, and also how new manufacturing processes have been explored and developed. There's just so much research and development going on in this space it actually feels like a really exciting time at the moment.

So, Adrian you've mentioned a couple of the applications already of solid state batteries, and you mentioned some of the vehicles. Are there other areas where solid state batteries, actually better suited in certain sectors to other batteries?

Adrian

Yes, thank you for the question Sheena, you know, so again it depends on the type of product, the chemistry and obviously the application is very unique. There is no battery that is suited to solve everybody's needs, alright. So we have the case of healthcare products that you know, cardiac pacemakers, that kind of thing you know like the Zosen company is making, which is fascinating actually in its application.

In our case we have been focusing on the mobility, as I mentioned, but also we have been deploying energy storage to integrate renewable energy. And a key to our technology particularly is that you operate hot without the need for cooling. So whether you're in a vehicle, you don't need cooling, that means a simpler design for the vehicle itself.

In the case of what most of our deployments have been saying in Africa, for example, he has a high tolerance to temperatures, hot temperatures, as well as cold temperatures so this a wider applicability in terms of operating temperature range without any type of limitations you say that lithium ion may have. And so, those are some that we have several micro grids more than 30 micro grids providing energy to remote villages in Africa.

And then we have integration and we're building right now a large site for the French renewal transmission operator where we're integrating renewable energy to help with the variation, the variability that will affect the production of renewable energy into the grid.

Nikoleta

Thank you very much for that. And John, let's look at the market more closely. What are the market trends for solid state batteries in Europe, what are the key highlights?

John

Looking at it from, two things I guess, from the OEM's, the car EM's but also from the technology developers. And there's quite a split here, and spit in the style like I guess of how Europe might go about developing something compared to maybe America, America being more sort of EC orientated and then maybe China and Japan. And, this very different contrast in the way the technology is coming to market. The European style of funded collaboration, maybe Astro Bat projects might be an example of that, where you get quite a big number of companies, maybe in the case of Astro Bat 14 different companies, and you develop something. This has issues of speed it, has issues of how the money gets divided up, between too many companies, perhaps, and there could be some IP issues.

So what we've seen is that although there is a good amount of activity in Europe in development of solid state we're also seeing, it's going quite slowly. Whereas, in America, you get the quantum scape or the solid power, and in China maybe Weilan and ProLogium, you get this faster pace of activity. So, sadly, I think Europe is going more slowly in the development and what that has meant is that the large companies VW, BMW, Renault etc and Daimler as well have typically had to look to America or look to Quantum Scape, to Solid Power, to other, Quebec hydro, they've had to look elsewhere. Because I think the speed of the pace in Europe in developmental terms is not necessarily fast enough. It's a long game, and of course over a period of time, Europe can catch up.

But its methodology is different from that sort of energy that you get from the VC backed American style.

Sheena

That's really interesting John. I don't know, Adrian, if you have a comment on that, because John's mentioned the US and Canada. How is that speed of development different over there?

Adrian

Yeah so, what I've seen and then following with John's comments, there have been literally billions of dollars poured into start-ups of solid state batteries in the last few years. And that created a lot of hype and the perception that these start-ups have a commercially available product. And the reality is that it takes a long, long time to develop a, I would say the infrastructure for a gear, a factory's capability. We have 25 years of R&D, we've been commercialising our product for 10 years and we know that going from a lab sample to a commercial product and then building the infrastructure to build a Giga factory level is extremely, extremely complex.

So, as a result of that, we see that there is a lot of confusion in the market and we see that people you know, don't quite understand it is a technology here, is it not there, and we're trying to prove again, you know that we've been doing this for 10 years with a product that actually has propelled vehicles for example more than 300 million kilometres. So this extensive expertise, experience and demonstration that the product works, at least in North America, that's how I see it.

Nikoletta

Thank you, and John, just a little bit on global trends, but more specifically: what's happening across the globe and is Asia a key market for Solid State batteries?

John

Well obviously Asia is the key market for battery production in the first place. But in terms of development, of course, one of the people who started the earliest in all of this was probably Toyota. And also being quite a conservative company, they probably are ahead but you wouldn't necessarily know it because they wouldn't have to announce it because they are Toyota, they will bring it to market when they are ready to bring it to market. Whereas if you're talking about an IPO funded company like Quantum State, they have to talk about things they have to make a big splash and the big sound. And so, it can sound like things are moving slowly in one area and fast in other areas but this is more a feature of funding that it is of technology.

And likewise the Chinese would like to bring things to market quicker. Therefore, they may use more polymer, more liquid, it is not quite as solid as maybe a solid state production should be, but it's actually maybe going to come to market quicker. So there's different things happening and then like again that the big sort of developers of batteries, the big giants are developing batteries, they're not necessarily going to rush to market a product which is going to replace the product they've already got. They're more likely to be again quite conservative about how they might introduce something which might eat away at their own market share or their own technology.

So there's lots of business and commercial and other reasons why technologies might take some time and why you might hear more things coming from one sector or one part of the world than from other parts of the world. But I think the consensus really, nothing much is going to come. Obviously Asia's got products on the market already but I'm talking in a general sense, 2025 onwards might be a time for things to go onto cars in a more mainstream way.

But realistically, Giga factories and Asia make a very good point as a massive journey between your first prototypes and something going into a Giga factory and being reliably manufactured. And that really is towards the end of the 2020s. Before we start, I think to see Giga factories producing solid state batteries that go on to passenger cars at some scale.

So it is a journey but there will be other applications in transportation and in non-transportation, well before then. To test the reliability and to test the scale and to test the production so it's going to be a fascinating space.

Nikoleta

Thank you very much, John and thank you all for your excellent insights. I have one last question so, five years from today, how do you think different battery technologies will have progressed? Do you think that there's a split between different solutions? Is there another battery technology that's really up and coming? So let's start with you John.

John

Even within solid state there are many different types of technology being developed and they will all have a different business outcome and a different technical outcome and therefore might find the way onto different products. So we, at Ilika, are looking at oxide based electrolyte materials, but also perhaps more unusually looking at silicon anodes, pure silicon anodes. A lot of people are chasing lithium metal anodes or anode-less designs, and then some people are looking at sulphide based electrolytes. But all of these are going to create a different outcome, which you might find a particular application better suits, or particular manufacturing method better suits.

So I think even staying within you know solid state batteries, there are probably 10 different outcomes giving 10 different solutions, and each of them will have its own merits and demerits. And yes, a long way down the line there might be some consolidation, because one methodology might prove probably more commercial than others, but that would still leave the others to be used on different applications if they are better solutions or innovations in that application. So, you know, Adrian may comment on even wider than solid state but even within solid state, there are so many different variations of what's being developed.

Nikoleta

Thank you, and Adrian, any thoughts on that.

Adrian

Yeah, absolutely. So, I mean they are competing in storage technologies. They go, you know, in a very broad in terms of applicability from potential energy and kinetic energy etc etc. But, you know, just coming back to the solid state which I think that is where most of the focus is, first of all, I wouldn't discount lithium ion. I think they will continue to grow.

However, I think that it will plateau in terms of performance. Now, in terms of solid state, we're, actually, we're manufacturing right now the third generation of our solid state product. So for us, it's an evolutionary progress if you will, in terms of improvements, and we see ourselves in line with the timeline that John described with 2025, perhaps, to have a product that is available for the passenger market that requires a higher density that lithium ion, at room temperature and fast charging application. We see that we're going to meet that without a problem and we're actually talking to ERM's and various companies to try to align our product with their needs.

Nikoleta

Thank you very much. So thank you to our brilliant guests, and thank you all for listening. We hope you enjoyed this discussion as much as we did. Don't forget to visit our online hub on ukbatteriesnetwork.org and register to receive news and updates and participate in the networking area of the hub. Our next episode will focus on batteries for off-highway vehicles.

'Til the next time, bye.

Voiceover

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Notes: this transcript has been produced verbatim and includes all the quirks and idiosyncrasies of the speakers.