Umicore at the Core Event in Poland

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Umicore's future-proof innovation approach

Frank Daufenbach
Chief Strategy Officer

Thank you, Ralph.
So thank you, Ralph, for reminding us of the fundamentals of our business, the underlying drivers of our business. We will now get closer to what Umicore does and we will answer two questions in the next section that I will co-present with Geert, our CTO.

First question we will answer is what is CAM? I will go fairly quickly on this because I assume that this is a known thing for most of you.
The second question we'll answer is how does Umicore proceed in order to always be on top of the technological needs for this product?

So starting with what is CAM? Physically, and you may see it tomorrow during the visit, physically CAM looks like a grey powder. But we know that this grey powder does some magical things in the lithium-ion battery. It does four things that are critical. Number one, it drives the performance of a battery. Everything that Katharina was mentioning before about the range, the energy density, all of that is dependent on the CAM.

Second thing it does is that it drives safety as well. If you don't have a good quality CAM, if you don't have the right level of purity in your CAM, you can have a thermal event. And that's definitely something you don't want to have in your electric vehicle.

Third important thing about CAM is that it drives a lot of the CO2 content of the battery, 60% of it. You know that the vast majority of OEMs and cell makers have very ambitious CO2 targets. These cannot be reached if they don't get CAMs that support the low CO2 ambition.

The fourth thing that CAM drives is the cost of the battery. And Ralph alluded to it already. He said it's driving roughly half of the cost of the battery. This is very significant. The vast majority of these costs of CAM, 80% of it, is in fact the value of the metals. And one of the reasons why the innovation that we do at Umicore is critical is that with our innovations that Stephan and G.S. will present, we can reduce the quantity of these expensive metals in the CAM, and therefore we have a powerful lever with our innovation to reduce the total cost of ownership of future electric vehicles.

So for all these reasons, CAM is a critical, high-tech, micro-engineered product. Now that's from a product standpoint. I think we've established now fairly clearly CAM is very important. It is driving a lot of the performance of the car, safety, CO2 content and cost. That doesn't necessarily make it an attractive market. And so now what I would like to do is share with you why we have the conviction that the CAM market is a very attractive one.

And it comes down to one thing. It's the entry barriers. This is a market that has very high entry barriers in three categories.
First category is product innovation. This is a high-tech product. It's a micro-engineered product. This is a product that in order to be on top of the technology trends requires hundreds of scientists internally, requires connections with universities, academia, startups, other supply chain partners.

Without this and years of experience, you will not be on top of this technology. So that's a very important barrier to entry. On top of the high-tech nature of the product, it's also a product that goes to the automotive industry. So you have to add to the complexity of the product the fact that you need to follow strict, stringent requirements from OEMs.
Qualification cycles that require years. And here as well, Umicore has the experience. We've been doing that for batteries for quite a few years and for automotive catalysis for even more years.
So product innovation, the ability to innovate, that's a high barrier to entry. And we clearly are positioned to overcome that barrier. And we've done it. And we in fact even raise this barrier, as you will see today with the innovations that we will bring to the market.

Second barrier to entry is the necessary process excellence. Why do you need to be process excellent at CAM? There are a couple of reasons.
A, it's a highly complex product. It requires a pharmaceutical level kind of purity management. And so you have to reconcile this part per billion purity levels with the fact that we need to produce thousands and thousands of tons of this.
So the plant that you will see tomorrow, it's a special plant where you reach pharmaceutical kind of constraints producing tons of material. And you will hear more about that from my colleagues as well. So that's one reason why process excellence is key. You cannot deviate from excellent product quality, otherwise you jeopardize the safety of the vehicle.

The other reason why process excellence is key is because we are talking about an expensive process to be quite honest. This is a capital intensive industry. So you need to design your processes extremely well. From the beginning of your plant, from the time you put the CAPEX in the ground, you need the right engineering, you need the experience, design the right process, you need to procure your CAPEX well and you need to run these facilities in a flawless way. And we have the experience of doing that. As Ralph was mentioning, we have a global network. We've built several of these plants already. We've gone through cycles of mistakes and now we are, we believe, at the top of managing these process excellence.

Third barrier to entry is the ability to supply the metals. As I said before, 80% of the cost of the CAM is coming from metals and these are not any metals. These are metals that are sometimes hard to procure. You need to make sure they are available, that's one thing. You need to make sure that they are available from low CO2 sources and ethical sources. And this is again an area where Umicore, with a history of decades in the metals industry and a couple of decades of supplying in particular these metals, nickel, manganese, cobalt, we have an edge.
On top of this, we master the steps of precursor CAM, refining, leaching, that allows us when we need to, that allows us to procure the materials at a different step in the process and therefore gives us flexibility.
So our conviction is very few companies check all these boxes and we definitely check them and we check them based on our experience and our teams.

For the rest of this presentation, this section, we will focus on the product innovation part and we'll explain to you how we are set up in order to always innovate in this area of CAM.

So how do you make sure you stay always on top in this technology? Well, the simple answer is you make sure that you configure yourself to be present at every step of the innovation cycle. We have decomposed this cycle here in four steps.
Screen is when you look for new technologies, you reach out to the external world, you have your own scientists making experiences and you have ideas. It's an ideation stage. Incubate is when you have an idea and you start testing it. You test it with customers, you test it with partners, you have small sample, you change the sample formulation and you progress and you get to something that's viable.
These first two steps apply to the next generation products. This is what Stephane Levasseur will present a bit later today. And for this, we have a dedicated group that we call corporate innovation and that is dedicated to this early stage, making sure that we never miss a trend. We never miss a long-term trend.

Now, if you go to the right of the page, the greener part of the page, this is where we look to the shorter, short to medium term innovation. Here, it's about validating your product, continuing the development with a customer to make sure that you meet the specs of your customer and then industrializing it in an excellent way, in a flawless way with your customer, and then improving their quality and their output requirements. For this, we have a dedicated team, the business unit innovation team and G.S. will present more about that, that day and night works with our customers in order to make sure that we get to exactly the product that they need for their medium to short term needs.

With this, I would like to hand over to Geert, who will tell you more into details how we are set up internally to actually deliver on each of
these steps. Thank you.

Umicore's future-proof innovation approach

Geert Olbrechts
Chief Technology Officer & Executive Vice President

Thank you, Frank.
So, good afternoon also to all of you from my side. What I will do now is explain a bit further this future-proof innovation set-up and how that really differentiates us from our competitors. Frank has already explained on this slide our organizational setup. This is one key differentiator and I will…

The second one I would like to share is our footprint and footprint means two things. It's on the one hand, the amount of people working on our battery material research. Today, we have roughly 400 colleagues working every day to advance on the technology side and these 400 colleagues are embedded in a broader community of 1,300 R&D colleagues in Umicore. And with that, they can also tap into the competences that are available in different areas in the company, be it refining, be it powder metallurgy, be it analytics, be it also competences from automotive, where we are very strong, where we have a very strong history with our automotive catalyst business.

The second element to footprint is our global presence. And so today we have a huge presence in Belgium with roughly 130 colleagues. We are very active in Finland in Kokkola with roughly 70 colleagues and we have a very strong presence in Korea with over 200 colleagues working in R&D.

We are expanding that to be sure we have research activities globally. So we will set up applied technology labs in Loyalist at the same site where we will host our North America production facility.
We will also install an applied technology lab in Hanau, which is a multi-BU site where today we have our automotive catalyst headquarters. And two weeks ago I was in China and we announced that also in China, in Shanghai area, we will open a research innovation center for two reasons: to really tap into the local Chinese ecosystem in terms of attracting local Chinese talents, but also in terms of understanding what is happening in the local China market.
So that's a second element success factor that we see in our future-proof innovation model. This is how we are organized internally.

The next element that I would like to comment upon is our open innovation, meaning partnerships. We have recognized over the last years partnerships become even more and more important. And we see partnerships in three areas.
We see partnerships with universities, with academia. We see partnerships with start-up and industry leaders. And we see partnerships with cell makers and car OEMs. And especially in that category, we have beefed up massively our collaborations. We have much more partnerships with the OEMs. And by that, we have a much better voice of the customer. And we are much closer to understanding the customer needs, which is crucially important to feed that back into our innovation products.

The contacts and the partnerships with academia, on the other hand, are really important to understand what are breakthrough elements that is cooking at the universities or at startups that we have to watch, that we have to incorporate into our technologies. So those partnerships help us to tap into the technology push elements. And by that, we can address the future needs of the OEMs. We have roughly 60 university partnerships to give you some numbers. We have more than 200 technology partnerships. You see some logos. These are just a snapshot of those we can publish.

In the middle, you also see Idemitsu, and you will learn much more about Idemitsu later, which is a collaboration we have to work on the future solid-state battery materials.

That brings me to the next innovation success factor, and that's our end-to-end approach. And that's really something unique. We are active in research in pCAM. We are active in research in CAM materials, and we also are very strong in our battery testing. So combining all that gives us a huge advantage, because there are no barriers. We can openly discuss, so we can easily understand how a material property now translates finally in a cell performance that we can see in our battery testing.

So to give you a bit more flavor about each of these elements, I will in the next slide go deeper into each of these three categories.

So pCAM. So pCAM are micro-engineered powders, and they're roughly the size 1/7th of the diameter of a human hair. But more importantly, they come in various shapes and forms, and we have to control the morphology, we have to control the porosity, we have to control the crystallinity, we have to control the composition. So it's really a very high-tech powder. And by making this, or by optimizing these pCAMs, you can heavily

influence the final performance on the battery. And that is illustrated schematically on the right side.

If you use conventional pCAM materials, which are more potato-shaped, amorphous from structure, yes, you can make a battery, but the lifetime of that battery is not superior. It's like roughly 10 years if you want to put a number on it. If you optimize these pCAMs, you make good spherical particles from a certain crystallinity and purity, you can enhance the durability of your battery, and you make batteries that last easily 20 years.

So this, just to give you an understanding, that better pCAM, controlling the pCAM, can heavily influence the battery properties, and therefore it's for us crucially important that we do research on these further pCAM advancements.
It doesn't stop at pCAM. Yes, pCAM heavily influences the performance of the battery, but also at the CAM level, we can do a number of things.
We have to control our processes very carefully, and by optimizing our process parameters, we can boost the performance. Another way to boost the performance of the CAM material is by adding pre-processing and post-processing steps. Michiel will comment on that tomorrow.
And also at the chemistry side, you can do further things. You can add dopants, chemical elements, you can add coatings, so to coat the CAM material to protect it and to improve the interaction with the electrolytes. And these are all innovations that further boost the performance of the material at the CAM level.
So I think it's clear by now that the performance of, or that an NMC is not just defined by the chemical composition in terms of nickel, cobalt and manganese. There is much more to a CAM material than its pure chemical composition in terms of these three elements. And I invite you to listen carefully to the detailed explanation of G.S. and Stéphane to understand that better.
And that makes that our products are unique. They're really tailored to the specific customer needs, and they're not easily replaceable by a product from a competitor.

So that brings me to the following point, battery testing. So it might seem easy to test the battery, but actually it's high-tech and it's very specialized work. And we have accumulated 25 years of knowledge. We all put that in our battery testing labs. We have dedicated teams that further develop these competences on how to test the battery in a reliable way, in a reproducible way, in a way that the results we generate with our battery tests are completely synchronized and similar to the results that our OEMs have. So synchronizing our testing protocols is something extremely important. And there we also build a lot on the knowledge and the know-how that we have generated in our automotive catalyst business, where we have a similar process. We need a good handshaking protocol. And for batteries, the handshaking protocol is the battery testing. So it's a unique competence. It's highly valued by our customers. Many of our customers even come to us to learn and to improve their own systems.

So that brings me to this picture, which we have and was nicely introduced by Katharina, so I don't have to go through in detail.
So it summarizes how we see the market going forward. And so it's based on our technology intelligence and our market intelligence. So this is the portfolio. And given everything I explained and what also Frank explained, we believe with the set-up we have, with the footprint we have, with the end-to-end approach we have, we are technology leaders today.

And that's also why we believe that we will be technology leaders going forward.
So on the next two days, we take you on a journey. And to let you feel maybe a bit how exceptional that journey is, I would like to invite you to bear with me and maybe make a picture or an image. And the image or the comparison I want to make is that you're invited in a top restaurant and you come to the restaurant and the chef says, "I have something special for you. I invite you in my kitchen."
So you can sit in the kitchen of the top restaurant and you can see all the master chefs at work. And so they prepare the menu. I think this is our menu. Some of them, and that's more G.S., will be working on improving the dishes that they will serve this evening. So the short and mid-term technologies, the mid-nickels, the high-nickel, the HLM dishes, he's working on that. That's for the service this evening.

Stephane Levasseur**,** he's in the test kitchen. He's working on the menu for next month. He's looking at the all solid-state batteries, at the sodium-ion batteries, at the DRX batteries.
And so that's important to optimize the recipe. That's what we do in R&D. But also, a feature of a top restaurant is that in the evening during the service, every plate that goes out has to have the highest top quality.
All plates have to look the same. They have to taste the same. They have to smell the same. And I think that's also where Umicore is unique, where
Michiel will tomorrow explain how we do that in our production.
We have these production capabilities. We have these high engineering standards. And that helps us also is valued by our customers, that we keep these standards and that there is no fluctuations in standards.

So with that, I would like to wrap up our introduction. And I think we have now a Q&A session to answer some of your questions. Thank you.

Q&A
Caroline Kerremans, Head of Investor Relations
Mathias, can I also ask you to come on stage with us for the Q&A session?

So as I mentioned, we will give priority to the people in the room to ask their questions. The people online, you are invited to raise your questions via the chat. In the room, we have two lovely ladies walking around with a microphone. So could I ask you to wait until the microphone is handed over to you to ask your question? And then please state your name and your company before asking your question. Thank you.

Chetan Udeshi, JP Morgan
You spend a lot of time on talking about process innovation – I don't know if there's a way for you to quantify how Umicore is better in something versus your closest peers? I'm assuming you know what your closest peers are doing, because that may be a secret in itself. But if I go back two years, I think Tesla talked about dry process for electrode manufacturing. Is that something you guys are looking at? Is that something viable? Is that what differentiates? Anything on process innovation? How should we think about it in terms of differentiation? Any proof points that we can look at? Of course, we'll try to get some sense tomorrow, but just for now.

Mathias Miedreich, CEO
Absolutely. So indeed, when we talk about process technology, we should differentiate two different things. The first one is the technology itself, the process. So and what you will see in the presentation of Michiel is what are the, you know, there are a lot of processes, but some of the processes really matter. So where are we differentiating ourselves from the others? Because there we're doing the things better, like the precipitation process in the pCAM. It's the firing in the CAM and others. And here it's how can we prove that we are better is simply by the output that we achieve in this process. I think you will see that tomorrow much more in detail.
And then the second part of it actually is more on the topic of CAPEX density as well as OPEX performance. And here what you can see is that I hope you will you will see that tomorrow that by the approach of nonlinear manufacturing. So kind of a decoupled approach between different process steps, you can take out several elements that are very important in manufacturing. The most important one is scrap. So the scrap rate, I don't know if we have quantified the scrap rate. I'm not sure if we want to do that. But let's think about that when we have the presentation of Michiel tomorrow. But with the set-up that we have where we have discrete quality checks after the different manufacturing steps, we achieve a much better scrap rate than we have seen ourselves in the more linear processes.
And the other one is all around the flexibility. You know, when you're conviction is that the market going forward is a market of various chemistries for different customers that and the predictability of the amounts for those customers is also fluctuating, if you can change over your manufacturing system in the most cost efficient way and time to go from, I don't know, mid-nickel high-voltage to HLM and the next day to solid-state battery material. I'm making it too simple. That's also a key performance indicator that we're measuring. So the change over time and the flexibility in the production program. I understand that it will be even more. It's even better to, you know, have some key KPIs to share with you. And let's think about that. What could what could be those KPIs. But I hope also that from the presentation tomorrow you will see what we mean with that.

Chetan Udeshi, JPMorgan
Thanks.

Ranulf Orr, Citigroup
Just staying on the topics of CAPEX. Can you give an idea of how you see the CAPEX intensity evolving, you know, over the next kind of five to 10 years, the modular approach makes it sound like it's going to stay at a pretty similar level. Thank you.

Mathias Miedreich, CEO
Yeah, so the CAPEX density is influenced by three things. The first one is, is it a greenfield or brownfield? The second one, it how much can we improve the technological CAPEX density? And the third one is inflation, which is, you know, working against the first two ones.
So for the first one, greenfield to brownfield, you have seen that with our latest footprint in Canada, we have now manufacturing footprint in all of the four automotive world regions, China, Korea, Europe and North America. So we don't need to do another greenfield. And with that, the biggest kind of first hurdle in terms of CAPEX is behind us.

The future expansions that we will be doing will be less capital intense. So now, how much, as a rule of thumb, you could say that we think it's between 25 and 30 percent that the brownfield is less capital intensive than a pure greenfield.
Secondly, okay, I leave the inflation outside because inflation is what it is that we cannot influence other than contractually with our customers. But from a technical point of view, the copy paste approach that we have, obviously is not a 100 percent copy paste approach.
Because if you look to Nysa, for example, you will see tomorrow that there are also several elements for the same thing. So we have several halls for firing. There was a first hall with the first ovens. The ovens had a certain length. Then there's a second hall and a third hall.
And what we're trying to do at this example, we are trying to increase the lengths of the ovens so that we can instead of using several firing runs, we can do it in one run. With that, we unlock capacity. And with that, we bring down capacity density. The plant in Loyalist will already get the latest version of that and not the first version that we have installed when we started Nysa.
So there's also a continuous improvement on the technology level. That's more difficult to quantify on an overall level. Let's see if Michiel can come up with something there tomorrow. But these are the two elements.
So you should think that excluding inflation, the CAPEX density is continuously going down over time. But even including inflation, the picture shows that we can overcompensate the inflation effect, especially through the fact that we have now greenfields everywhere. Or that we have brownfields now everywhere and don't need to do a green field anymore.

Riya Kotecha, Bank of America
I have four questions, please.
My first one regards slide 19 that you presented with more than 10 different cathode chemistries in just Umicore's roadmap.

Mathias Miedreich, CEO
Can we go to slide 19 maybe, quickly, that would help us to. Yeah, sorry.

Riya Kotecha, Bank of America
That was a slide with the different chemistries. Yes. So I'm just wondering, how do you decide where to focus your resources on internally by R&D and efforts to commercialize such that you position yourself in the right and winning chemistry by 2030? That's my first question.

Mathias Miedreich, CEO
So if I'm not saying right what the question was when we look at all of these different elements in that chemistry, how do we know on which one to focus, which one to prioritize? I would hand over to Ralph for that question.

Ralph Kiessling, Executive Vice-President Energy & Surface Technologies and upcoming Executive Vice-President
Yeah, for the chemistry to prioritize, we of course have different criteria, different… Katharina mentioned it…

Mathias Miedreich, CEO
It's okay… You're going down…

Ralph Kiessling, Executive Vice-President Energy & Surface Technologies and upcoming Executive Vice-President
Okay. But it works as well here…

So we have different, we have different criteria, as Katharina mentioned, they are depending, of course, on the different regions.
And let's say what are the preferences on the regions and for the customers. And we are closely interacting here for the customers when it comes to the chemistry selection. And what is the portfolio also in the
segmentation portfolio? What do you need? What the customer needs in North America? What the customer needs in in Europe? You have different requirements on, on range, for instance, on energy density. You have different requirements that are playing into fast charging.
So these are coming in, then you have cost components. And here is that new chemistries come into play. We talked about, and G.S. will do it more in detail, is for instance, HLM, which is an innovative technology, which is reducing the metal cost because it's a lower nickel content. But it's really stretching also the energy density.
And of course, we develop this together with the requirements and with the preferences of our customers. So we have intensive, let's say some intensive sampling requirements with our customer before we narrow it down and decide which is really the tailor technology for certain application.

Mathias Miedreich, CEO
And I would say, and I would ask also yet for your input here of that short and mid term range. The one that we think is the next most important one and where we put a lot of emphasis on is the HLM.

Geert Olbrechts, Chief Technology Officer & Executive Vice President
Yeah, that's definitely on the that's where we put a lot of effort. That's what will come next in the market. If you take it one step back on your question also on mid-nickel and high-nickel. How do we then prioritize our projects?
I think you have to understand we have a technology or a technology family like mid-nickel is a technology family. It's there. It's developed. But then we have to tune it for a specific customer, for a specific application. And so we select basically out of the discussions with our customer, which are the projects where we as Umicore want to be qualified.
And then, based on that road map, that customer road map, we have done an R&D road map to start from this general box, mid-nickel to develop specifically for that application. And so it's depending on the amount of customer projects, customer requests we get sales programs we have in our sales forecast, that we then tune resources into the specific projects. And that's for the developed technologies.
And then you have the one like HLM where there is still some general development work needed. And there we have then separate project teams, will bring this technology to a certain level of maturity from which we can then tune it into the specific customer programs when there is a demand or request.

Riya Kotecha, Bank of America
Thanks. My second question is how this relates to battery chemistry penetration assumptions by 2030. So today you mentioned a 30 percent global LFP assumption that's been revised upwards from about 25 percent last year. If I look at what some auto EMs say, people like Tesla mentioned LFP with LMFP can take more than a 60 percent market share. Some B.S.F. presentations indicate a 40 to 45 percent market share. And by capacity announcements, if I look at players like LG Chem and Sin Chan, who have announced new LFP capacity in Morocco for the North American market, that already forms about 15 percent of the market by 2025. And so I'm just wondering what the risk is of this assumption being moved upwards in due course and how your portfolio can be LFP proof.

Mathias Miedreich, CEO
Yes. So summarizing the question, it's around LFP and it's about the risk for Umicore of LFP, right? That's actually how are we dealing with this risk and is our market assumption on LFP growth maybe to conservative,
maybe it's higher than that?
So of course, nobody knows exactly where how the market is developing in 2030. But for us, what we take, as very important is the input from our customers. And we can only relay what we understand from our customers. And this understanding from the customers is actually pointing us into the conviction that for sure LFP is a great technology and it has all of the, it fulfills all the promises that it has.
But that's only true for China, in China. As long, as the moment you go outside of China, there are several hurdles that LFP needs to overcome.
And I'm not saying that this is not overcomable hurdles. It's absolutely possible. But when you do that and that influences the price point of LFP, you know, the recyclability, the CAPEX, we have discussed all of that. Other chemistries come into play that outside of China have similar or even better properties. And what our customers tell us is that when they look into these future portfolios, the HLM variant is one that they see as most promising, because nobody wants to use LFP if they don't have to, because already having two different battery chemistries, per se, is more complex for an OEM - not speaking about the supply chain - and I hope that you will see in the presentation that G.S. will be doing right now - HLM is not the only answer to that question.
And also, it's not a black and white question. When you have the three market segments or the entry, the mass segment and the premium segment, it's not possible to say this chemistry is here and this is there. There's always an overlap. And I think if maybe we wait until that presentation has been done by G.S., you will - and later on we can follow up on the question - but I think that gives a very good view why we feel so confident that with our portfolio that's not including LFP, we are covering all of the market segments.

Riya Kotecha, Bank of America
Thanks. And just quickly, my third and fourth question, regard the second presentation. So how do you think about the right R&D budget to support your portfolio and technology? Some cell manufacturers who are now co-developing Cathode speak about $1 billion R&D budgets. And if I compare, Umicore spent somewhat more than 100 million euros last year in E&ST. Do you think that spend needs to accelerate to keep up with the disruption
in the market?
And then related to that, how do you think innovation in this industry translates to pricing power? Does new technology or products mean you can have a higher

processing fee as you move from one Cathode grade to another? Or do you need innovation just to stay flat in terms of pricing?

Mathias Miedreich, CEO
So there are, I think, two parts of the question. The first part is on are we sure we can be relevant with our size of R&D that we spend versus the $1 billion that you mentioned for some cell makers? Aren't we too small with the innovation that we're doing?
And the second question is do we believe that with innovation we can have an impact on pricing up or is it just something to be in the game?

So I will answer the second question first and then I hand over to you for the first question here.

So we have very good reason to believe that actually innovation is a means to increase transformation premium. And the math that we make is pretty simple because as we have said from the Cathode material that has the biggest cost impact to the battery, 80% or so is coming from the metal.
So if we are able, and we have seen that already, if we're able to come up with chemistries, innovations, technologies that use less and if it's say 20% less of that metals, we are able to increase our share at the same time. So it's beneficial for us, but it's a huge saving on the battery and that's exactly the same mechanisms we have seen over decades on the automotive catalyst business where it's exactly the same where the price of the catalyst is mainly driven by the platinum, rhodium and palladium price. And when we came up with technologies that can use less of those materials, we have been able to upscale pricing and we see that now and benefiting from now in our running business and automotive catalyst.
And maybe a hand over to you now if we think that we are well equipped with our R&D power versus the giants of the world.

Geert Olbrechts, Chief Technology Officer & Executive Vice President
Maybe three elements I would like to answer to that one.
So first of all, we have our strategy and based on our strategy, we define what is needed on R&D to be successful in our strategy and we put no limit on that. We just staff it for success. I think that's a given. Second one, why is it less than battery makers? I think there it's important to understand that the more downstream you go in a business, the bigger those R&D budgets become.
A cell maker, they have to look at packs, we have to look at battery testing, but they have also to look at the next step. They have to build battery packs and this hugely blows up further their R&D budgets. So it's not comparable on budget of a cell maker with a budget of a cathodes manufacturer. We believe strongly we have in place what we need. Of course, we try to mitigate the further increase of our costs by investing smartly and that's also why we widely use partnerships, why we widely apply for funding measures to mitigate the costs of R&D, but still be able to put in place what is needed to be successful for our RISE 2030 strategy.

Mathias Miedreich, CEO
Further questions?

Wim Hoste, KBC Securities
Yes, good afternoon. I have two questions, please. The first one would be on the contract flexibility you have with the customers, specifically regarding HLM. You expect

a lot from that. How is that baked into the contract? Can customers choose at some point to switch relatively rapidly to HLM if it proves to be technologically what you expect from that and what kind of impact would that have on profitability? So that's the first question, maybe I'll let you answer that one first.

Mathias Miedreich, CEO
Yeah, so when we talk about our order book and the contracts that we have, it's always on specific applications and technologies. So it is per se not flexible.
What I mean with that is that behind this order book, this big hundreds of gigawatt hours, each line item is describing a certain chemistry that builds up to this order book. That's important because chemistries define pricing. So we have a pricing for all of these different chemistries that go in batteries that go in car models.
That does not mean that we cannot change the chemistry. We would change the chemistry in a way that, you know, through the discussion with the customers. And that's the normal way in the automotive business through the years of production.
There comes upgrades or facelifts or other models. It's the same here on the battery in the moment that any of our customers would come to us and say, hey, for this contract, I want to introduce this and that other NMC mid-nickel or HLM. We are very open to that. We can do that. That's the beauty because we, we don't need to build a new plant for that. We can just do it in our plants.
But it's always then a new pricing and the new pricing in the automotive business is always an opportunity. So I hope this answers your question. So, yes, we can react to changes in customer demands, but it will be at a different price point that that will be defined by the chemistry.

Wim Hoste, KBC Securities
OK, thank you. Then a question on the comparison of LFP versus HLM. I think in the past you said that at some point that HLM. might be 10 percent cheaper than LFP outside of China.
Can you confirm that also with regards to technology progress that has been made, for example, by CATL in terms of charging times, ranges, etc. Is that still the case today?

Mathias Miedreich, CEO
So I will deliberately would not answer this question because that's exactly part of G.S.'s presentation. You will see it on the slide. We have some benchmark data on that as well.
So the short answer is yes, it's still cheaper. But the details you get in six minutes from now.

Wim Hoste, KBC Securities
OK, sure. Thank you.

James Hooper, Bernstein
So first question, I wanted to go back to the kind of the growth that you saw in the market, particularly with mass and premium being more important and also a kind of a sentence that was mentioned that range was a very important factor.
Can you elaborate what you're seeing from customers and requirements about this in terms of range or cost or any other key factors in the mass market? Because I think that kind of ties into the LFP question discussion we're having.
And then the second question is about metal sourcing and obviously the kind of the importance of that for customers. Can you talk a little bit about your sourcing program

and the ethical side of things? I mean, with particular reference to cobalt and some of the different jurisdictions that's mined in.

Ralph Kiessling, Executive Vice-President Energy & Surface Technologies and upcoming Executive Vice-President

Yeah, what we see when it comes to the first question, what we see in terms of the customer requirements when it's, when it's in terms of range and in terms of application.
We currently see that, let's say, long range requirements, especially for the applications in Europe and in North America, are not limited only to the premium segment. They go in the mass segment. I think this is also reflected in our current pipeline, which is to a large extent, is a high-nickel pipeline.
Nevertheless, of course, and that comes back what G.S. will tell us now, maybe in about four minutes, is that we are, of course, looking further on the four competitive solution that combine a very competitive cost base on the one hand and having these requirements on higher energy density on the other side. So we are expanding clearly the portfolio.

Another example is - also G.S. will go into - its mid-nickel high-voltage, which is combining the requirement on, on range, on fast charging, but also, let's say, with the affordability question.
This is an coming to your question on metal sourcing. So we have metal sourcing, we do through different means. Of course, we have long term agreements with suppliers to the metal sourcing. We combine it also, let's say, certain of the metal sourcing is, is coming from customers.
Sometimes there is even a split between us, an agreement between us and the customers on the metal sourcing. So we are doing the metal sourcing is directly as metals or as intermediates are sulfides.
On the other hand, it can go also into, let's say, preprocessing routes. So it's important to have a diversity of different sources for the metal sources to secure security of supply as we, on the other hand, of course, have requirements also on regionalization. We talked about this earlier.

Mathias Miedreich, CEO
I think that's a very important part because you mentioned that also in the beginning, it's a technological capability as well to accept as an input different kind of raw materials. Maybe you can elaborate a little bit on that. What is the range of those materials?

Ralph Kiessling, Executive Vice-President Energy & Surface Technologies and upcoming Executive Vice-President
Yeah, the different input and range of materials, as I said, that's coming from, for instance, intermediates. We call it MHP, for instance, the immediate intermediates for nickel, also intermediate for cobalt, which have a refining step.
Then there are certain grades on metals like so-called nickel cathode metals, which require a refining step. Or there are also different sources that we have on the sulfide side.
So to have really these three different feeds, to have the security of supply and secure the right amount of metal for our customer programs is critical and paramount.

Caroline Kerremans, Head of Investor Relations
As we need to be a bit careful with the time, let us take a final question from the room. The questions from the audience online have been answered in the meantime.

Mathias Miedreich, CEO
So you said last question?

Caroline Kerremans, Head of Investor Relations
Yes, final question from the room.

Niels, Millenium
So you talk a lot about yield improvement and CAM density per kilowatt hours improving thanks to your innovation. Can you give us a sense of how much you think you can improve the yield per year? And also, do you think you're going to keep this for yourself or do you plan to share these benefits with your customers?

Mathias Miedreich, CEO
So I think there are two elements of the question. The first element is operationally how we can improve the yield and reduce the scrap rate and improve our operational performance. And the second one is, if I understood it correctly, the energy density of our cathode products per volumetric or gravimetric unit.
So the first question, we're not in a position to share the quantification of that because it's a commercially sensitive element.
But what we are for sure able is to use that to continue to be competitive on the market in the environment also where you have inflation and other things. So I would say it's a partially sharing.
We will partially share it with our customers to get new business to have a very competitive price point. But partially it will be also, it's part
of our conviction that this business will yield an EBITDA north of 25 percent, EBITDA margin, post 2026.
So that's all of the elements inside. And again, then about the energy density, I want to point to G.S. because it's all part of his presentation that he will now do in 30 seconds from now.
OK, then thank you very much. Let's go to the next step on close to midterm cathode materials.

Caroline Kerremans, Head of Investor Relations
We saw that a lot of you were waiting with a lot of excitement for this presentation because a lot of the questions that were raised will soon be answered by my colleague all the way from Korea, Geon Seog Son

Thank you.