

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

Introductory Jingle 0:01

Innovate UK KTN connecting for positive change.

Nikoleta 0:06

Welcome everyone to this new episode of the Battery Caffe, focusing on critical minerals in the battery supply chain. I'm Nikoleta Piperidou from the Clean Energy and Infrastructure team at the Innovate UK KTN. Hosting today's episode alongside my colleague, Dr. Sheena Hindocha. Hi, Sheena.

Sheena 0:25

Hi, everyone. My name is Sheena and I look after Materials Chemistry at KTN, covering a range of different topics including critical minerals, circular carbon and batteries. It's great to be back at the Battery Caffe. Thanks for having me and I look forward to today's conversation.

Nikoleta 0:40

Thank you very much, Sheena. Just a brief introduction to the Battery Caffe. It is an initiative of the Cross Sector Battery Systems Innovation Network, a community funded by Innovate UK KTN and the Faraday Battery challenge. This innovation network aims to open new markets for the battery industry, promote innovation in batteries, and help decarbonise a wide range of end users. If you haven't already, please go check out our online platform at ukbatteriesnetwork.org. You'll find lots of useful material and all the previous episodes. So today we're being joined by Olimpia Piltch, International Partnerships and Business Manager at the Critical Minerals Association. Hi, Olimpia.

Olimpia 1:25

Hi, everyone. It's a pleasure to join today on behalf of the Critical Minerals Association. So thank you very much for having me. The CMA UK, united with industry, academia, governments and other actors to create resilient, responsible and diversified critical mineral supply chains that are necessary for the UK's chemicals and manufacturing sectors, and of course batteries. So thank you very much for having me. And I look forward to speaking more about critical minerals.

Nikoleta 1:50

Thank you very much Olimpia. Everyone, make yourselves a coffee and join us.

Sheena 1:58

Critical minerals are of critical economic and technological importance, but they're also experiencing major risks to their security of supply. In July 2022, the government published the UK Critical Mineral Strategy and a refresh was published in March this year, with 18 Minerals defined as having high criticality for the UK and a further five on the watch list. The strategy aims to accelerate growth of the UK as domestic capabilities, collaborate with international partners, enhance international markets to make them more responsive, transparent and responsible. So that's that being said, Olimpia, the Critical Mineral

Association works squarely in this space. Can you provide us with an overview of critical minerals, your organisation and the activities that you do?

Olimpia 2:40

So probably best to start off with critical minerals as a whole. So they are metals and non metals that are deemed essential to an industry and nation's economic goals or security of supply. And typically, critical minerals are vulnerable to supply chain disruptions. And that can vary depending on the economic settings, geopolitical disruptions. So sometimes critical minerals are also very difficult to substitute, or are heavily monopolised by certain nations. So critical minerals are, as we like to say, critical due to the underpinning nature of the modern world, especially the net zero transition and some of the renewable technologies. So we cannot build electric vehicles, wind turbines, solar panels, hydro electrical plants, or hydrogen based tech without raw materials. And so I don't want to bore everyone about just everything that the CMA covers, but we look at various aspects of the supply chain, so anywhere from exploration all the way down to original equipment manufacturer. And we look at issues such as environmental and social governance, public perceptions of critical minerals, how they are extracted, and most importantly, how in the future, we can make sure that we're not repeating the mistakes of the past and that our batteries are truly sustainable. So I think that covers a very generic overview. And so if you want to find out more about the association, you can head over to our website at www.criticalmineral.org.

Nikoleta 4:12

Thank you very much Olimpia. And you're definitely not boring us. It's such an interesting topic. Just for those who are not very familiar with this space, why are critical minerals important to the battery supply chain?

Olimpia 4:26

So just to put it very plainly, there are no batteries without critical minerals. We can't just grow our cathodes and anodes. They have to come from somewhere. And at the risk of sounding like a typical geologist, if it cannot be grown, it has to be mined. So despite great R&D efforts in the recycling space, for the foreseeable future critical minerals such as lithium, graphite, nickel, manganese and cobalt will continue to require extraction. Ultimately, we have to source this huge huge increase in demand for electric vehicles from somewhere. And at the moment that is primarily coming from extraction. Those minerals have to then be processed and refined. Typically, minerals, such as lithium are not always processed in the same country where they are extracted. So that involves huge carbon footprints when it comes to transport. And for example, lithium from Australia, all the way to China for it to then be shipped back to Europe or the US wherever the manufacturing of the battery cell happens. So at the CMA, we are looking at localisation of supply chains and making sure that some of these supply chains are shortened. And that value is added in the country so that the nations that are extracting those critical minerals, for example, lithium, or cobalt, gain direct benefits from that extraction rather than just passing the value on to another nation such as China. Especially looking at the growing demand for lithium ion batteries. It's incredibly important to make sure that nations in the global south (where some of these critical minerals are heavily concentrated) benefit from responsible practice, rather than just extracting them by any means necessary.

Sheena 6:13

That's a really interesting Olympia. Thank you. And I think it is really important to share that view of not just economic value, but social and ethical value within the minerals, as well. And you've touched on this a little bit already, but that security of supply of these materials and the products that they're in are vitally important for the energy transition, and achieving the UK is Net Zero targets. So, could you expand further on some of the risks associated with critical minerals, in particular, those that are used in batteries.

Olimpia 6:44

So there's quite a wide range of risks that we need to look at for batteries, especially because of the different battery chemistries that we're looking at. And in terms of some of the more familiar supply chains around lithium, even with Australia being the dominant producer, Hydroxide is still being shipped to China, which accounts for more than 70% of refining. And we see this across other commodities. So taking cobalt, as an example, primarily produced in the DRC. And of course, many of us are already aware of the different socio economic and environmental issues - child labour etc that are occurring. But despite the DRC having the geological endowment, China is still dominating that midstream processing refining space, by accounting for more than 70% of that supply chain. So in terms of the push towards Net Zero, we have to make sure that the energy transition is truly equitable. And of course, because of the supply chain concentration, and for many battery minerals China has with that dominance, we then face an issue of how do we diversify our supply chains, but also do the right thing. So as I mentioned, it's not about just digging stuff up as quickly as possible. It's about how we can form the right partnerships with the right partner nations. For example, the UK and Australia seem to be a natural match. Australia has the critical minerals, the UK has the chemicals expertise. We need to bridge the gap of the midstream to move it away from China. And that's not simply because we don't like China, it's just a case of we need to have a secure supply. And as we saw of COVID, and the lockdowns, that supply chain was disrupted. And we see this across other R&D technologies. So the chip shortage is a great example of what happens if your supply chain is overly concentrated. And of course, we have the R&D in the UK to make these things happen. The UK is where the history of mining started, especially for deep mining. We have the processing expertise that has slowly migrated over time into other nations, and now we're facing the shortage. But if we want a battery centre in the UK, if we want to build on some of these sectors that we've been championing, so that the automotive sector would need to have security of supply. So it's really a complex issue. But through collaboration with partner nations and with some of these producing nations in the Global South, there is a huge opportunity to attract OEMs into the UK and make sure that we don't lose our already fabulous automotive sector.

Sheena 9:23

Yeah, that's really interesting and that geopolitical nature of it and that global partnership aspect, I think is of particular interest particularly in that battery supply chain piece. So, I mentioned earlier about the UK Critical Minerals Strategy and the UK has also set up the Critical Mineral Intelligence Centre, which is led by the British Geological Survey to gather intelligence on the supply and demand of critical minerals, their supply chains and the use by the UK industry. And recently they've produced a series of profiles exploring the geological potential for the UK to mine battery minerals, which I think Olympia, you've just sort of mentioned as a global asset, but also bringing it back to what the UK can do itself and how it can secure its own supply.

Olimpia 10:12

Yeah, so the UK has a huge opportunity. We know we have lithium in the Southwest, particularly in Cornwall. We've got a cluster in the Northeast as well. We've got wonderful juniors, looking at direct lithium extraction from brines, rather than traditional just digging it out. Of course, that is wonderful, because it has such a lower footprint, in terms of the surface and the area that the mine has to cover. But also, the extraction is much cleaner, much simpler, maybe not technically simpler, but in terms of environmental aspects. And of course, you know, we have exploration ongoing for copper tin cobalt up in Scotland as well. So we have the potential to have some domestic production. But it's really important to note that no matter what production we have in the UK, it simply won't be enough to meet the demand. So we'll always have to source from overseas. But without investing actively into that domestic sector, then we have no chance of having any security of supply. And of course, it's all well to have the extraction in the UK, you also have to have the processing and the refining, want to add value to the economy and to create jobs, especially with some of the levelling up areas in the northeast, it makes perfect sense to have these refining plants that serve the UK. And of course, these materials can go directly into UK batteries. Of course, you know, you still need the anodes and the cathodes. So some of this material will always have to come from overseas. But again, through partnerships that can be achieved. And with the right support from the UK Government, some of our junior explorers, and we have some mines, which are already moving towards production as well, there is a huge opportunity to produce responsible batteries from mine, all the way to sale.

Sheena 12:07

That's really fascinating. And we've done some work in the past on that kind of battery supply chain, all the way through from mining into battery materials, packs and modules. And I think, yeah, it's really important to develop those local supply chains. I guess one of the ways to address the criticality of minerals is to look at substitution. And this can be done in a whole range of different ways. For example, replacing one mineral for another and I think in battery chemistry is an example of this, would be utilising sodium ion, over lithium ion, as an example. You can also look at developing new types of cell chemistries. And these represent some interesting technological challenges. Olimpia, where do you see the innovation opportunities to mitigate that sort of critical mineral risk within the battery supply chain?

Olimpia 12:54

So I think there's a two way approach that you can take a look at. So firstly, it's the batteries themselves in terms of, I think what we saw recently is a lot of R&D into addressing people's concerns over a range in society. For example, whether the batteries will be fit for purpose in colder climates, hotter climates. But in reality, most people live in cities, and they don't need to travel that far. So whether R&D can head towards faster charging, which I think is a huge selling point for a lot of people. We already see some EVs charging, that's 5 - 10 minutes. And of course, also making them cheaper. Which, you know, if you live in a city, and you're just driving to work, you're dropping the kids off to school, you just go into your local supermarket. You don't need this super expensive battery. You can have those substituted materials, which can be cheaper. So it makes a product that's more accessible, to a wider range of society. And the other side of that is R&D within the refining itself. So that seems to be a huge pinch point from security of supply issues, with majority of refining taking place in China, so it's the cathode and anode production. So if we can figure out ways to make those

processes more efficient, and thus, more feasible, then we can attract more companies to do this. Whether it's in the UK or it's in the EU, or other allied nations, to produce them at competitive prices to China, but in a responsible way, making sure the rights standards are met, making sure there's no child labour issues in those supply chains. So I think that's a very exciting part. And of course, once you have that sort of purity of supply, and you can prove that you're producing these refined materials responsibly, then it's very attractive for automakers and battery manufacturers to look at the UK and say, Well, this is the place we want to put our Giga factories. This is the place we want to really grow a domestic battery sector in.

Nikoleta 15:02

Thank you very much Olimpia. And there is also an opportunity to secure the supply of critical minerals through recycling. Where do you see the role of recycling and materials recovery in helping to secure supply of critical minerals for batteries?

Olimpia 15:17

So recycling is absolutely crucial in terms of the circular economy. And of course, we're going to have so many batteries coming towards the end of life within the next 10 years. How do we dispose of them? How do we make sure we didn't dig up all this lithium or all this cobalt and graphite, and now we're just gonna dump it somewhere, or it's just gonna sit somewhere unused. It's such a huge source of critical minerals that need to be refined and then repurposed through whether that goes back into batteries or somewhere else into the critical minerals supply chain. So the opportunity is there. Of course, as you probably already know, recovery rates and efficiency are a huge problem. So how do we merge doing the right thing in terms of recycling some of these batteries, but also making the profits? And ultimately businesses' goal is to keep their shareholders happy to turn that profits. So I think there's a role for the UK government to provide some sort of support to incentivise greater recycling. And of course, in the UK, we're already seeing so much innovation in space. So many startups, looking at how they can create alternative supply chains through greater recycling. Of course, that goes back to the earlier question about how can the UK secure its own supply? Well, you know, digging it out is one way, but also supplementing that with recycled materials is another great way to do that.

Nikoleta 16:43

Thank you. And talking about recycling, Sheena, we're about to release our Battery Recycling Vision by 2035. Would you like to say a few words about this piece of work?

Sheena 16:53

Yeah, absolutely. The aim of this works to show the potential that the UK battery recycling industry has to grow between now and 2035 and where it could get to. We're trying to highlight that the development of a circular economy, whereby battery materials are separated, recycled and then re manufactured into new batteries, all in the UK, would allow for significantly more of a batteries economic value to be kept within the UK economy. This would also help reduce the UK's dependency on other countries for critical minerals, very much like Olimpia was just saying. So Nikoleta, anything to add on that?

Nikoleta 17:31

Thank you. I think it is a great piece of work; a summary of what is happening both in the UK and abroad, and the topic of battery recycling and reuse, it's very much an international challenge. The Global Battery Alliance has just launched their world's first battery passport proof of concept. And Germany has launched its battery pass project, and the UK also, we're expecting a consultation to update the regulatory framework. Lots is happening, and it's definitely a topic that requires international collaboration. For the audience, you will find the link to this vision paper on the notes of this episode.

Sheena 18:09

Thanks. And also looking further into that global context, Last year Innovate UK KTN delivered a global expert mission to Canada and the US on critical minerals and that covered battery materials as one of the key topics. There's also one up coming to Australia and Olympia, you mentioned Australia as being a potential key collaborator. What do you see as the role of that international collaboration both in securing supply and developing those supply chains?

Olimpia 18:37

So, I think in terms of Australia specifically, there's that just natural partnership between source and critical minerals from Australia. But of course, we know that they are now trying to move further downstream by having some kind of processing and refining. And of course, they have the battery ambitions as well, with the current consultation on the National Battery Strategy being in process. As we're already seeing, with UK companies setting up early stage processing over Australia, with then further refining plans in the UK. So it seems to be a natural match. And of course, the UK has the benefits of the automotive sector, which a lot of the critical mineral companies in Australia are trying to tap into. And in terms of broader international collaborations, we have to acknowledge that the UK will not be a huge producer of critical minerals. We will always rely on that component of needing those partnerships to secure those critical minerals from somewhere. So we need to be quite careful about how we do that, especially with the ongoing kind of geopolitical tensions. And as we saw, there's already so many partnerships taking place and it's such a dynamic environment. So the US recently joined forces with the EU and they are now planning some kind of Buyers Club. Of course, where the UK will fit into that is slightly tricky. In an ideal world we'd like to plug into that and benefit from the upcoming US critical raw materials, and of course, the inflation Reduction Act benefits. That would be the dream scenario. But how that pans out there remains to be seen. And in terms of the best position in the UK, I think we have a lot to offer, especially through our three ports, and the R&D hub. It's just making sure the rest of the world knows that. So I think that's a role for our industry to go out there and fly the flag for UK innovation. But also, we need the governments to actively promote what the UK is doing. Saying "hey, look, we're open for business. Here's what you can contribute to, here's how we can help you". So it's something that requires greater collaboration on all sides from academia, industry and the governments.

Sheena 20:55

Yeah, you're absolutely right there. Thanks, Olimpia. Whilst this podcast is focused on critical minerals for battery materials, there is a significant amount of activity in this wider space. And a few weeks ago, the 15 million pound Circular Critical Materials Supply Chain Programme was announced by the Department of Business and Trade. This programme will focus on developing UK based supply chains for rare earth elements, and is hopefully of

interest to some of you listening now. So if you'd like to find out more, you'll find details on our website, or please do get in touch.

Nikoleta 21:28

Thanks, Sheena. And thank you both Sheena and Olimpia, for your excellent insights. We have one last question for you, Olimpia. So in your opinion, what is the most exciting opportunity for the UK in critical minerals, specifically for batteries?

Olimpia 21:43

So probably at the risk of sounding like a broken record, I would say the refining space. So it's really crucial as it binds together upstream. So the potential to extract these critical minerals in the UK, and of course, the battery manufacture. So really, if you have that in place, and if you can create more efficient processes, and ones that are way more responsible for lower carbon footprints, you can then attract that downstream sector and you can really bolster security of supply. But also make sure that we can truly say we're producing British batteries. You know, we've got this drive towards Net Zero. We've got some very ambitious goals set for 2030. But we now need to make sure that you know, it's not just greenwashing and all our EVs will have to be imported from places where perhaps the production wasn't as responsible, or some of the battery materials that went into them weren't produced in the most environmentally friendly ways. So it's a huge opportunity. And hopefully, we'll see the UK's battery sector grow.

Sheena 22:51

Thanks, Olimpia. You've been a brilliant guest for all your insights and thank you everyone for listening to this episode. We hope you've enjoyed it. We definitely enjoyed the discussion. So please don't forget to visit our online hub at ukbatteriesnetwork.org and register to receive our newsletter updates and to participate in the networking area of the hub. This is the last episode in this series, so thank you everyone for listening. We hope you've enjoyed it. And bye bye for now.

Outro Jingle 23:19

Innovate UK KTN connecting for positive change.