Battery Caffe - Grid and Stationary

Welcome everyone to this new episode of the Battery Caffe, focusing on the grid and stationary battery supply chain. I'm Nikoleta Piperidou from the Clean Energy and Infrastructure Team at Innovate UK Business Connect, hosting today's episode alongside my colleague Neelam Mughal. Hi Neelam.

Hi everyone. My name is Neelam, and I look after advanced materials related activities at Innovate UK Business Connect. So this covers a wide range of materials for high tech applications such as energy storage, materials for space and materials in construction. Happy to be here. Thanks, Nikoleta.

Thank you, Neelam. And 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 Business Connect and the Faraday Battery Challenge. 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. 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 are joined by two brilliant guests. We have with us Alison McFadden, Managing Director at Continu, and John-Joseph Marie of the Faraday Institution. Hi Alison.

Hi, Nikoleta.

Would you like to provide us with a brief introduction?

Yeah, sure. So, my name is Ali, and I'm the founder of Continu, and we're in the critical power and battery energy storage industry. We started from scratch around 14 years ago, and we're now with some leading contracts for some of the most critical sites in Ireland and the UK, like BT data centers, Government sites, hospitals and large sporting arenas. So, although we're an SME, we do provide a specialist service with regards to backup power and battery energy storage systems.

Thank you so much, Ali. JJ, would you like to introduce yourself?

Sure, thanks Nikoleta. So, my name is JJ Marie. I work at the Faraday Institution as a principal analyst. I work mainly in our policy team, helping author public facing reports such as Faraday Insights, which provide evidence-based understanding on topics related to the battery industry. I also work on developing techno-economic analysis models of battery cell design and production and support our commercialisation team at the Faraday Institution.

Thanks so much JJ. And at this point I will just say, make yourselves a coffee and join us.

So, the Faraday institution recently developed the latest Faraday Insight, which is looking into batteries for energy storage applications within the stationary application. So, this highlighted that energy storage

is becoming increasingly more important to the functioning of a stable electricity grid. And I believe, in fact, as of 2023 the UK had installed 4.7 to 6 gigawatt hours of battery energy storage systems with significant additional capacity in the pipeline. So JJ, would you mind telling us a little bit around the Faraday Institute and some of the highlights of this report?

Sure, yeah. So, for people who might not be aware of the Faraday Institution, so we are a Government funded independent research organisation for batteries. So since our inception in 2018, we have awarded 200 million pounds in funding for battery research across 27 universities in the UK, with over 500 researchers currently carrying out research on a range of topics such as improving the performance and safety of existing lithium-ion batteries, but also working on the development of new technologies such as lithium-sulfur or sodium-ion batteries. As well as funding application inspired research, we help support the development of research through early stage commercialisation and inform policy makers through evidence based insights, such as our most recent one, on battery energy storage. So that's a bit of a bit of an overview of the work that we do.

Thanks JJ. Would you mind commenting as well on how batteries are used on the grid and what battery technologies are being used for stationary storage currently?

Sure. So, at the moment, in the UK, there's a big push towards net zero. I think the goal of the Government is to aim for net zero in the power sector by 2030 and this is going to involve transitioning away from our traditional sources of energy, which are fossil fuels, towards cleaner sources of energy such as renewables. However, one of the big issues with renewable energy is that they are intermittent in nature, so we cannot simply dispatch them when required to meet demand. And that's where energy storage can come in, because we can store some of the excess energy produced when it is sunny or the wind is blowing, and we can dispatch that when the sun has gone down in the evening, for example, to meet the evening peak of demand, or during periods of lower wind. So that's where energy storage can really help solve the problem of intermittency and renewables. In the UK, currently, there are two main technologies for energy storage, pumped hydro and lithium-ion batteries, although traditionally, pumped hydro has been installed for many, many years, the majority of new capacity is coming from lithium-ion batteries, which are being deployed for short duration energy storage. However, there is also a need for longer duration energy storage, and this will become increasingly more important as more renewable energy is installed in the UK. There are a number of new technologies, such as hydrogen and many battery chemistries which are under development for long duration energy storage. These include redox flow battery systems, sodium-ion batteries and metal layer batteries. These technologies could play a significant role at discharge durations of up to 100 hours. And really, one of the big advantages of batteries over other energy storage technologies is that they typically have higher energy efficiencies and higher energy densities. So, you can get away with having, let's say smaller installations, and they can also take less time to install compared to a pumped hydro installation, for example. Yes, so those are some of the battery technologies that are being developed and deployed there to meet this energy storage challenge.

Thanks JJ for walking us through those. Absolutely agree. The UK Government has set quite a few ambitious targets on the deployment and renewable energy. So, thank you. And Nikoleta, over to you.

Thank you. Thank you again JJ. It was a lovely overview of the energy storage landscape and the different technologies, etc. That was really great. Ali, would you like to tell us a little bit about Continu and your activities in relation to battery tech and grid and stationary storage? So how do you really fit in this space?

Okay, thank you. Yes. So, we would consider ourselves niche specialists, and since we started the business approximately 15 years ago, we've witnessed all range of power disasters, if you like, that have come from mainly not having uninterruptible power supply systems. So a UPS, is there to protect critical equipment, such as, it could be a controller that is set onto, say, an egg sorting machine at a food manufacturing business. So, the UPS is there to protect the energy that comes in from the grid, in order to clean the electricity from spikes, troughs and harmonics and so on. So, some of those pieces of equipment that are in the client site, for example, as I mentioned, the food production company, that equipment cannot tolerate what the grid throws at them. So that's where you need a UPS, and that is there to protect. But approximately five years ago, maybe five, at the most six years ago, we started to see a demand from our customer base, which are large manufacturers or critical sites, as mentioned, like a data center or a small data center, which might be called a server room, we started to get demand for the storing of energy as well as protecting the critical equipment. So that's where battery energy storage systems would come in. And from that point, we started to look at the supply chain, or commercial, industrial sized battery energy storage systems. And as JJ has rightly pointed out, there is a good amount of renewable energy in the grid system in the UK. However, the challenge is to store that. So, to store the energy from wind or solar. We have found so far that many of the projects that you see are large grid scale projects, or at the other end where there may be domestic applications. So, more and more housing estates are coming on board with solar plus storage. You know, a battery pack in your garage type setup, where we are and where we play in the industry is in that commercial industrial sector, and that is quite difficult to navigate, because it sounds easy, Oh yeah, well we can just get battery energy storage and it can be attached to our site. However, there are complications that come with that that I can go into, but that's where we are. We've got a strong pipeline of battery energy projects for the commercial industrial sites. However, the route to market for those customers is not well understood it's, I would say what you might call early adopter at the moment. And whilst there are some examples, it's not widespread. So, it's getting there, but it isn't widespread. So, a typical site would struggle with how to adopt that. And what we are seeing is many companies installing solar panels or wind turbines, and they are thinking, well the next stage will be, we'll get battery storage but first we'll just do the solar panels. And indeed, it's better for us as a company when we look at those projects that they haven't done anything because the battery, energy storage system is the boss of the site. In other words, that controller must be sized correctly so that you size the solar or the wind correctly and everything works. But that's not to say, okay, you've got solar panels or you've got a wind turbine that you can't add storage, of course, and that's the desire. It's just that it is quite complicated and each site is completely different, so one size doesn't fit all.

Thank you very much, Ali, and thank you for explaining this in detail, and you kind of already touched on this but is there anything else specific that springs to mind in regards to, like, what are the main commercial opportunities for batteries and the main barriers for adoption? I know you touched already on quite a few, but is there anything else you may want to add on that?

Yes, sure. So, there's, there's probably four main commercial opportunities for a typical commercial and industrial site. And JJ touched on some of these previously. So, you've got energy sponge, where all you're doing is storing excess energy from your solar or your solar PV system or your wind turbine, and you're able to store that. So as the weather in the UK is not reliable, it could be blowing a gale, is a really stormy day, and you've got a wind turbine, and it's fantastic, but certainly the grid operator, so here in Ireland, that would be Sony air grid, they have a challenge with that because they may even ask some of the wind turbine owners to switch off or curtail their actual asset. So, the next day, it's like a nice, calm day, or the sun isn't shining. And wouldn't it have been great if all of that energy from the day before was stored, and that's where the energy storage for the energy sponge, comes in. The other thing would be energy arbitrage, and that allows customers to use and play with the storage with different tariffs that they might have, so day and night tariffs. The third item would be for grid services. And there are various systems in place depending on where you're located, but here in Ireland, there would be various contracts that you can enter into if you've got the right connections, and therefore you can export some of the energy that you do not need back into the grid. And again, that's quite complicated, and each site is different, but the opportunity is there to actually make money out of energy, which is novel, and where we sit today, which is energy price has gone through the roof, and everyone is having to control those costs, but actually being able to push that back into the grid, there are ways of doing that. And then the fourth one might be for EV charging. So, there could be a case where we have maybe a logistics company, and they're increasing the fleet of electric vehicles, but the grid connection is not good enough at their site, so they're using battery energy storage to complement that in grid constrained areas. So, without having to do a grid upgrade, they can increase their fleet because they've now got a battery energy storage system. Now all four of those concepts, or those opportunities, can also be availed by one site. It could be just one of those for the site. As I say, each site is different, and that's the all the work that we do in designing the best case and the return on investment and what is sometimes referred to as value stacking the project.

Thank you very much, Ali. Neelam, I'm passing over to you.

Yeah, thanks, Ali for covering some of those barriers to adoption. I'm curious, if there's any others that maybe the report highlights JJ? Are there any other upcoming challenges associated with grid and stationary storage, perhaps related to policy or consumers?

Yeah, there are quite a few. And thanks Ali, for giving a really good overview of some of the different applications and services that batteries and battery energy storage systems can provide. But there are still a few challenges that need to be solved for grid and stationary storage to, I guess, meet its full potential. I think one important distinction to make is that there is both a need for short term energy storage and longer term energy storage. At the moment, the UK gets around 40% of its electricity from renewable sources, but we still rely on 30 to 40% of our electricity demand from fossil fuel sources such as gas. So, these can be easily dispatched during times of low wind or low solar. As we install more and more renewable energy on the grid, there may be longer periods during which we don't have enough energy supply coming from these renewable sources, such as during winter, perhaps during a cold snap where we need to heat a lot of our houses and buildings. If there's a period of low wind, we will not be able to supply that energy fully. And this is where the need for long duration energy storage comes in. At the moment, lithium-ion batteries are installed on the grid to provide short duration energy

storage, but their capital cost, or upfront cost, is currently too high for it to be used effectively in long duration energy storage applications. This is why new technologies need to be developed for this longer duration energy storage, but also new markets and new policies need to be introduced to help support the development of these technologies. So, what the UK Government is doing, is planning on implementing a cap and floor mechanism which would guarantee minimum returns to keep projects viable and capping maximum revenue to protect costs to consumers. This will help provide some economic certainty to projects, allowing long duration energy storage installations of new technologies to be deployed. There are also challenges for short duration energy storage, so this includes establishing grid connections for battery energy storage systems. At the moment in the UK, if you want to connect an energy storage system to the transit mission or distribution system, you must join a queue with some projects facing delays of 10 to 15 years to be connected. Projects in the queue are at different stages of development, which in some cases, prevents projects at advanced stages from being connected. So, to counter this, the NESO has said it will adopt a first ready, first connected approach to help speed up the deployment of battery energy storage systems and other renewable energy technologies. Just one more key issue which is facing the deployment of battery energy storage are the battery skip rates on the balancing mechanism. So, the balancing mechanism is used by the NESO to balance and is energy supply and demand in real time. A wide range of technologies, including batteries, are able to bid on the balancing mechanism to provide this service. However, batteries are currently overlooked roughly 30% of the time when they are cheaper than other technologies, according to the NESO, with some sites being skipped over 90% of the time during constraint periods. NESO are aware of this issue and is working to resolve it, which will take time but resolving it will be key to ensuring that battery energy storage systems can work efficiently on the grid to use a maximum of renewable energy.

Thank you very much for this JJ. Ali, do you have any comments or thoughts on what we just heard from JJ?

Yes. So as mentioned, we would be working in the commercial industrial sector for commercial sites, maybe large energy users. So, you're talking maybe a hospital, a large energy manufacturer. So therefore, the barriers that are mentioned by JJ are maybe not as constrained in that market. What we see now is that the technology is market ready and has been for nearly 10 years. The barrier for us is that the route to procure that is not well understood and it's difficult to navigate because many of the examples that we have seen so far are larger grid scale, and they are large investor run, big developers and the global players in the battery energy storage market, which is great because it is doing the job that it needs to do for grid stability. However, those customers that I mentioned, they want to avail of this too, and that's what we're passionate about. It's bring it to the smaller guys kind of idea. And for that, the demand at the minute in battery storage system outweighs the supply, so people are queuing up to get battery energy storage systems. But the procurement of this is not yet well established, so it's not the same as procuring a UPS system, for example, or a generator or a CHP plant etc, where it's very straightforward. It is not the same, and it is almost like you need to get in a queue to get enough of the battery modules and so on that are used to put together a battery storage system. And in that market where the manufacturers of that size of equipment live, they have got their own barriers, I suppose, because the global supplies of battery modules, which includes the various chemistries and chemistries which are being developed all the time to improve. That tends to be dominated by the EV

car market. So that presents a problem for distributed storage. It's almost like the second cousin to the EV market. What the barrier then is, it's not that the technology isn't there ready, it's the procurement of such, so procurement teams are not acting quickly enough, because they're not understanding you need to get in a queue here. You need to put your deposits down and you need to be brave. And that type of procurement has never been seen before but the opportunities that they can avail of if they go ahead with a project which could take six to 12 months, is absolutely phenomenal, and the type of costs that they might experience in energy could reduce them from a large manufacturer to something like a small bungalow. It's that exciting, and it has never been seen before for the last 100 years in terms of a revolution but you have to act and you can't sit back and wait, because we've got targets to meet, and it's already 2024.

Thank you very much, Ali. That's great to hear, and actually really encouraging. So, thank you for that.

Thanks Ali. Thanks JJ. So what I'm hearing there is that it's difficult to underestimate the relevance of stationary storage for the energy transition, and while some of the technologies still need to be scaled up and their cost significantly reduced before they can be deployed at large scale, it really sounds like there's so many opportunities there, and people are already taking advantage of that in various different sectors, so it's really encouraging to hear that. Thank you so much to both of our brilliant guests today and thank you to all of our listeners at home. We hope you enjoyed this discussion as much as we did. Don't forget to visit our online hub on the ukbatteriesnetwork.org and register to receive our news and latest updates and hear more from our podcasts in the future. Thanks for listening. Thanks to our guests, and bye for now.