Battery + Storage Podcast: Decoding Battery Analytics With Dr. Kai-Philipp Kairies, CEO of ACCURE Battery Intelligence
Host: Bill Derasmo
Guest: Dr. Kai-Philipp Kairies
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Bill Derasmo:

Hello, and welcome back to another exciting season of the Troutman Pepper *Battery + Storage Podcast*. I am your host, Bill Derasmo. Just to reflect on the podcast for a moment, we started this little venture back in 2019. Here we are in 2024, and this little engine that could continue to chug along. We very much appreciate the audience, because without all of you listeners, the program would not continue to grow, and we would not be able to attract the interesting guests that we continue to draw. Turning to the present, with me today is none other than Dr. Kai-Philipp Kairies. Kai is the CEO of ACCURE Battery Intelligence. Welcome to the program. Kai.

Dr. Kai-Philipp Kairies:

Hey, Bill. Thanks for having me.

Bill Derasmo:

Absolutely. Well, great to have you on today to kick off this next season of the podcast. Your company is a little different than many of the other companies that we have featured over the years on the program. Before we get into the company, let me just say a few words about you. You definitely come at this from the perspective of an engineer. You have advanced degrees in engineering, and you are a visiting scholar at UCLA, and then you were an energy storage engineer at Bosch and have maintained that engineering focus through your career, though broadening it some along the way. Why don't I give you a chance to introduce yourself and let us know how your career journey led you to become the CEO of ACCURE Battery Intelligence?

Dr. Kai-Philipp Kairies:

Absolutely. Yeah, you already mentioned it. I'm an engineer by trade, and it really has been all engineering for me my entire career. I actually stumbled upon the topic of batteries back in 28, at a time when the industry was really still in this infancy. I fell in love with the topic, and I really created my career around staying at the leading edge of what happened in batteries.

I ended up doing a PhD on the topic and later, became the leader of a research group, which during my tenure, became the largest research group in the world on grid connected batteries. A topic that back in 2012, 2013, no one thought could ever get that big. By chance and luck, I ended up in this extremely interesting field and was able to participate in its growth. That later on, also, led me to be in the position to start a company on battery data.

Bill Derasmo:

Well, certainly your timing was great, because as you just alluded to back then, maybe it was a question, but now there's no question that battery storage, grid scale storage, e-mobility, all of it centered around batteries has really exploded. Obviously, anyone who's tuned into this podcast over the last few years has helped us chronicle the growth in the sector. Tell us a little bit about the things that your company can do for people who are operating in this space.

Dr. Kai-Philipp Kairies:

Batteries are a new asset class, which brings a lot of new challenges to owners and operators of these assets. For one, it's electrochemical units, so different laws, really more complicated laws, if you will, of physics and chemistry apply to these assets. Then of course, they're also used in a different way, right? Solar panels create electricity when the sun goes up with batteries, you can actively control to charge, or discharge at different times of the day. It just has a much wider field of potential use cases that you could do. And so, you need to make more decisions.

With the solar panel, you put them up and then you maintain them well, but the battery has much more input that's needed from the operator site. One of the things that we've seen with solar and wind over the last 10 years is that digital solutions can just drastically improve the availability and also, the revenues of solar and wind sites. The same is true for batteries. Five years ago, there was no digital solution for batteries around. I saw that working with all these companies back at the uni, they were struggling. They were having problems to keep the batteries safe, to keep them in a good operating point, to make a lot of money, to extend their lifetime, but they were lacking the tools. That's when we said, hey, there's a market opportunity. We actually know how to do it. Let's build something. That's what ultimately became ACCURE.

Bill Derasmo:

There's a lot there to dive into. Past discussions, maybe we've talked a little bit about some of the issues when batteries first started being deployed at scale. Maybe we've talked a little bit about the PJM region and some of the troubles, maybe that they had when batteries hit PJM in large quantities.

As an example, the batteries designed a certain way in terms of its cell life. That depends on using the battery in the way that it's designed and in accord with its warranty. If you are having the battery at a full charge, then draining it a 100%, then back up to draining it down to zero, then back up to 100%, etc., just as a very basic example, that's the thing that can really affect battery life, rather than say, maintaining its state of charge within certain parameters that are somewhere between those two numbers. Just using that as an example.

Maybe dive into that a little bit. If you're a potential customer, battery manufacturer, or someone, maybe who's going to use the battery, operate the battery, own it for various use cases, what's the service that you guys could provide in that regard?

Dr. Kai-Philipp Kairies:

There's a few questions that every operator of these huge battery assets should ask themselves. As you mentioned, depending on how you use the battery, it can degrade within five years, or live up to 15 years. Especially these first systems that got deployed, they had some estimations about lifetime and usage that were somewhat inaccurate and ended up just degrading the batteries in less than half of the expected lifetime.

If you're only running frequency response, for example, in a very narrow state of charge range, a battery can live up to 20 years. If you're cycling the battery heavily, maybe two cycles per day or more, it's pretty likely that it will not live up to 10 years. Unless, you have specifically designed a system for that particular use case.

Digital services are really decision support tools. Number one, they tell you where are you in terms of degradation today. How has the past operation degraded the asset so far? Did anything happen leading to safety critical behavior that you might want to be aware of? Or for example, in decision support, based on the chemistry that you have, what does one cycle cost you? If you can make more money in the market than you have in terms of aging costs, it's probably a good decision to do it. But if your aging costs are higher than the money you make, you probably don't want to run this additional cycle.

Bill Derasmo:

Well, that would be critical in terms of establishing operating parameters, I would think, for the owner of the asset, just what you ran through right there. Earlier in the discussion, of course, you hit on primary, or frequency response. Anyway, that is one of the great, I think, early use cases for lithium-ion batteries, because they can respond so quickly. I appreciate you using that example, too. Because I was involved, as people know, as I mentioned, I talked about in the past, I was involved in a case where that was the use case, so it's interesting to me personally.

In terms of, again, other services that you guys can provide, I mean, how about maybe helping customers figure out how to configure a project to meet a certain use case? Maybe you could speak to that a little bit.

Dr. Kai-Philipp Kairies:

Maybe just for reference, there's a lot of startups around and everyone has great ideas. I'm really proud and happy that we've built a sustainable business over the past year. At the moment, we are working with over, somewhat in the 30s of battery sites around the globe on six continents, some of the leading players in the US, in Europe, in Asia Pacific, that we support with digital solutions for battery systems.

We have a very, very unique and good view into the market. What's available from a system integrator perspective, from an EPC perspective? What are typical use cases? Who is making how much money? Why is a system that's pretty much the same as mine making more money? What can I do to get into that benchmark?

Before a system is online, there obviously are a few crucial steps in the beginning. I mean, once, of course, getting a good grid connection, getting transformers delivered in time. These mundane things have a huge impact that are non-battery-related topics. On the battery side, one example that we are heavily invested in with our customers is making sure they get good warranty conditions. Because oftentimes, a system integrator will have some carve-outs in their LTSAs and warranty conditions that basically render these documents worthless after two or three years.

Then the surprise is big, when an operator finds out that the first claim they want to file gets put down by the integrator saying, “Oh, you've lost your warranty after six months, because he didn't use it in the way we specified.” That happened a lot. I'm sure that you get as many of these stories as we do, right?

Bill Derasmo:

Right. Well, that was the first thing, I think, we really started with was that when you use the battery in a different way than it was designed, then the cell life impact, right? Like you were saying, you could have cells that could last 15 years or longer. But if you're constantly cycling them up and down, then their cell life could be as short as two or three years. Building those types of terms and conditions into your warranties, like you said, could have a huge impact. I appreciate you mentioning that, because that's a lawyer's domain. But it's critically important, as you say. There's a lot that you said that is of interest to me. I mean, you were saying about the need to get a good interconnection.

The other aspects of the service, the other components, I should say, besides the actual battery installation, the transformers and the wires, etc. There's a lot that goes into it, obviously. It's good that you're mindful of all those things.

Dr. Kai-Philipp Kairies:

One example, perhaps that I could add, is commissioning. So many storage projects are experiencing delayed commission. Just think about ERCOT, for example, the ERCOT market summit is next week. I think, probably, a lot of your listeners will be there. If you have a three-month delay in commissioning, which is typical across our portfolio of two dozen sites, or three dozen, we see that three months of delay are typical. If because of such in delay, you're missing out on a market opportunity, like Uri, the winter storm, or a heat wave, you can easily lose a 10-million-dollar market opportunity or more in these three months. The value and the costs of these commissioning delays are massive.

What you want to do is if you have a delay, it's typically because something didn't work as expected. Oftentimes, system integrators, EPCs, they don't know why. Oftentimes, it's the second or third system that they're putting on a field, they're not very experienced. And so, anything that happens takes longer to fix. If we come in as ACCURE with digital tools that tell them, “Hey, we can tell you, the problem is in container 27 in the third rack on the bottom. There's a loose screw.” We can see from the data, from the internal resistance behavior of that module against the 10,000 other modules we have that someone didn't tighten the screw correctly. Just go out and fix it. It'll be done in an hour, versus a subcontractor of the EPC running in circles across the site, testing this and that without really knowing what to do.

Bill Derasmo:

That is a fascinating run through, because you mentioned things like, a delay in their supply chain issues, there's a lot that goes into it, but the reason for those delays. If there is a delay, like you said, you could really miss out on significant market opportunities. You mentioned Uri. I was involved, probably people will see my name. They'll know I was involved in the Winter Storm Elliot litigation at FERC and ultimately settled, thankfully, I think for a lot of parties. But those types of events, that's really where storage could play a critical role.

I think we've talked about some of these extraordinary events and how storage can fill that role. If you could speak more broadly to that in terms of that use case, because either extreme heat events, or storms or whatever, and I think California has already talked about the important role that grid scale storage has played. If you could speak to that a little bit, I think that would be interesting for the audience.

Dr. Kai-Philipp Kairies:

Happy to. This is actually going back to my last job at the uni. We were writing these big reports for the International Renewable Energy Association for the European Commission, for the German Government. Because at the time, from a technical perspective, it was plausible that storage is needed to enable higher shares of renewable energies and also, to reduce system costs. In some cases, storage is cheaper than adding more high voltage connection lines. Not always, but in some.

Generally, what you can find in pretty much any grid around the world is if you have really weak grids, or if you have island grids, storage has the highest value. For example, Texas, because of the lacking interconnection to the other states, it's an islanded grid, which means the flexibility in terms of shifting electricity from A to B is limited.

I mean, Texas is huge. But still, from a weather perspective, you typically don't have a lot of different weather situations across the state. If there is no wind, it can easily affect the entire state. You have a risk of concentration. This concentration risk, in parts, can be mitigated through storage, because it adds flexibility. The same is in the UK. We're a German headquartered company, but our strongest market for best right now is in the UK, because it's an island. They added a lot of wind to their system, just like Texas, which makes storage extremely valuable and also, availability of storage, because you really want to cash in on those few opportunities. The market is much more liberated in Texas, so it's more spiky there. Even in the UK, storage has a higher value than, for example, in mainland Europe.

Bill Derasmo:

Those are great contrast and examples, and we could geek out on the market differences for a long time. Texas is fascinating, right, because they added all this wind in the crest zones and the West Texas in particular. Yet, as you say, when that wind goes quiet, it can have a significant impact statewide, or ERCOT-wide, I should say, because there is a portion of Texas that's not an ERCOT. Then contrast that to the UK, that's very interesting. As you say, the ERCOT market is more volatile, I would imagine, I would say. That's probably because of the way that generators get compensated is basically, energy-only construct. It's a difference.

It's a great example as you're walking through with the wind. The wind blows heavily at night, right, and more heavily at night. That's when it's generating more, as opposed to the solar, obviously, which is only during the day. By definition, pretty much. Do you find yourself dealing with projects, cases where it's pairing the storage with wind, for example, maybe a combination wind and solar type installation? I should say, what's the contrast in terms of projects that you're working on, standalone storage versus these hybrid projects?

Dr. Kai-Philipp Kairies:

We do have a lot of hybrid projects that we're working on and also in the pipeline. One public example that I can talk about in ERCOT is with National Grid Renewables, who have a hundred-something megawatt-hour site paired with a big solar installation. Going forward, I really believe that the majority of big solar plants will be coupled with storage. From a technical perspective, it's better to share the grid connection from a system stability perspective. It's beneficial. Around the world, we see that the market mechanisms are now being adjusted to also make it economically more attractive. In some regions, it already is. In other regions, governments are working on it right now. I'm pretty sure that it will see an additional uptick in popularity.

From our perspective, it doesn't make that much of a difference, because what we really do is make sure that the asset does what it's supposed to do. Our promise is we basically take care of the risks that are associated with batteries using software. We make sure it doesn't blow up, that you get a warning a few weeks ahead and you can be proactive about it. That one example that we have right now as everyone's moving to LFP, LFP iron phosphate batteries. They became really popular over the last two or three years and they now have a market share of almost 100% for large-scale storage operations.

They're great. They are more affordable than the traditional NMC batteries, which are also in electric cars. They're heavier, but who cares? In stationery, we put it in a container. The one challenge they have is they are not very good at knowing their state of charge. The error of state estimation can easily go up to 15 percentage points, which means the battery thinks it's fully charged, but in reality, it only has 85%. If you're waiting for the market to hit the cap and you're expecting to get 600 megawatt hours of payback, but in reality, it's only 85% of that. You're missing out on millions of dollars, or the hundred thousands of dollars easily. To have a software that tells you, be aware, this is the reality, so you should fix your site to react as you expect, that's where our worth comes in. That is both for hybrid and standalone systems.

Bill Derasmo:

Well, in that last example that you give too, it's not just the missing out of the market opportunity. It's creating challenges for the market operator. The market operator thinks that you can run until X time, 2,000 hours, say, but your charge is going to be depleted 15%, whatever that sooner. Maybe you run out and you're not releasing any more energy onto the grid. It's a, instead of 20, 1,900. Then the operator is not going to understand what's happening. It's going to create a little incremental reliability risk.

Then also, you're probably going to get hit with whatever the consequences of that are. It could be penalties, or whatever. There's a lot there. It sounds like, your company can certainly play a role in safeguard in the owners and the operators from that risk.

Dr. Kai-Philipp Kairies:

What we want to do and what we want to build is just tools that make the lives of operators easier. Basically, the idea is if you have a team of three or four people, you can either operate and maintain a portfolio of perhaps, 300, 400 megawatt-hours. Or with the right tools, the same team can support 2 gigawatt hours. Just because a lot of the things are automated and you have a better visibility. It's really about effectiveness of ops teams.

Bill Derasmo:

Well, let me ask you this. If folks are listening and they want to work with your company, tell me how they do that. How do they interface with you? Where are your facilities, for instance? But how do they get the process rolling?

Dr. Kai-Philipp Kairies:

It's really similar to what you would have in solar, where you also have monitoring solutions that grab data from the inverters, typically, and then bring it all into one platform. Then some of them add analytics. Some are just show you the values. We come from deep science. We have over 20 PhDs on the team that build advanced models that we're not just showing you the data that the site feeds to us, but we're using that data to train models and show you what's happening inside of the batteries, so that you can predict what will happen tomorrow, in a week, in a year. It's a really deep, sophisticated modeling approach.

However, the interface part is quite simple. Every owner and operator today has access to the battery data. It's just become an industry standard, like voltage, current, temperatures, and all these things. We typically interface with the system integrator, so perhaps a fluence, or a power in, or with the EMS provider. There's different supplies for that. That's a cloud-to-cloud connection. We can typically set it up in less than a month, including chance going back and forth, the actual work just takes the day. Once we're set up, we put together the dashboards for the company, so they can see their entire portfolio, benchmark one side against the other, benchmark sites within each other and all these things.

We also offer continuous support with our experts. Their entire job is to be the battery experts for operators of best. They can take the learnings and best practices from one side in an anonymous way and provide them to other players and say, “Hey, we've seen this issue with the CATL 280-amp battery already 200 times. This is the best way to fix it.” By the way, if you want to make a claim, we have a template for that.

Bill Derasmo:

Oh, that's fantastic. Let me go in a different direction, because I'm just curious. But we started out saying that you have an engineering background. That's really who you are, etc. It sounds like, you and your team are sophisticated, obviously, on economics, markets, etc. Tell me a little bit about that. First of all, just from a personal level, what the challenge and reward for you might have been on that front, but also, just your capabilities of your team.

Dr. Kai-Philipp Kairies:

Yeah. I started out as an engineer and really, with the engineering mindset. You just fall in love with a problem and you want to solve it. That's an end in itself for a lot of engineers. When you start a company, I think a lot of things change, because as a company, I strongly believe that companies don't have a right to exist. Companies only have a right to exist if they provide value to society. If they don't, they shouldn't exist. The resources could be used in a better way.

From the very beginning, we always had asked ourselves the hard questions like, “Do we have a reason to exist with German and engineers?” We can be pretty harsh, even with ourselves. What makes me happy is to work with companies that appreciate our services and that we can make better. It's really rewarding to work with companies like National Grid Renewables, many other owners and operators that do fantastic work in stabilizing our grids, keeping the lights on, moving our grids to more clean, renewable energy. These are the heroes.

If we can provide them with tools that make their life easier, that help them make more money, that they can reinvest into doing other great things, that's really where we want to be. Again, I think once you look at the entire value chain, even for an engineer, it becomes obvious that we need to help people make money in order to stay in the game.

As a CEO, it's my job to go to the young engineers and say, “Hey, I need you to be aware of why we're doing this. Then I'm going to leave you alone with this problem that you care about.” Ultimately, we need to solve economic problems, or we don't have a future.

Bill Derasmo:

Sure. I mean, it's the marriage of engineering and economics. I think that's a lot of participation in the energy markets, what it comes down to. Especially if you're a project sponsor and you're trying to get something interconnected into one of these markets, you got to understand the interplay of those two things.

I mean, I'm going to get a far feel from my legal background, but I would assume that the economics and the market mechanisms, to an extent, drives the engineering. It drives the engineering solution. It's just interesting. I just wanted to ask that, because you had gotten into some fairly sophisticated market discussions. But I know that you're an engineer at heart, so I wanted to get into that a little bit. I appreciate that.

There's a lot more that we could hit on, I'm sure, but I think we're coming to the end of our time. I really appreciate the time you took today to visit with us. I hope you enjoy the conversation. I would turn the mic over to you one more time to say, how can people reach out to you, learn more about your company and your services?

Dr. Kai-Philipp Kairies:

That's very kind of you, Bill. Thank you for having me and for this opportunity here. A good first starting point, obviously would be the website, Accure.net. We're also on LinkedIn and we are on all the big conferences in energy and battery in the US and in Europe. A lot of companies,

when they start out with batteries, are uncertain about what services they need, what – there's optimizers of different kinds. There's asset management platforms. There's all these different services that are available.

What we've really found is that once companies get a taste of what we can do in a small, limited proof of value, as we call it, they tend to stay customers forever. That's great. Just my offer to everyone, get in touch just on a 20-minute call and see what it's all about.

Bill Derasmo:

That Accure.net is A-C-C-U-R-E.net, right?

Dr. Kai-Philipp Kairies:

That's correct.

Bill Derasmo:

Yes. Folks, go out there, learn more about Kai and his company and the services that he might be able to bring to you. Again, we're happy to have had this visit. It's the start of a new season here, so we appreciate it and we'll leave it there. Thanks, everyone.

Dr. Kai-Philipp Kairies:

Thank you, Bill.