**Siemens Grid Software Podcast <de>coding the future of energy – Episode 1: <co>innovation through collaboration with Peter Körte and Jack Dangermond**

**Speaker 1** [00:00:04] Hi Lisa. Is this seat taken?

**Speaker 2** [00:00:06] No, no, it's all yours.

**Speaker 1** [00:00:09] I didn't see you yesterday at the graduation barbecue.

**Speaker 2** [00:00:12] No, I was sorry to miss it. I had a job interview and didn't get back till late.

**Speaker 1** [00:00:17] Oh, cool. I guess with your grades, the IT firms must be all over you.

**Speaker 2** [00:00:21] Dunno, maybe, but I haven't spoken to many IT firms so far.

**Speaker 1** [00:00:26] Okay, let me guess. One of the big Silicon Valley tech companies or a fancy online retailer?

**Speaker 2** [00:00:33] I was looking for something more purposeful. I was at southern Germany's biggest energy cooperative.

**Speaker 1** [00:00:39] Why is such a company on the top of the list for an IT crack like you?

**Speaker 2** [00:00:44] Ever heard of the super smart grid?

**Speaker 1** [00:00:46] Yeah, well I know the smart grid. My parents have solar panels on their roof and a storage battery in the basement.

**Speaker 2** [00:00:51] Well, right now, the energy cooperative is building a huge network made up of many small electricity producers and consumers. It involves all sorts, like wind power, hydro power, smart buildings, concentrated solar power, local combined heating, power plants, and even electric vehicle batteries.

**Speaker 1** [00:01:14] Doesn't sound that new.

**Speaker 2** [00:01:16] Yeah, but customers are getting involved, too. Through taking a financial stake by investing in local energy projects, but also by committing to smart ways of running their electrical appliances to minimize their costs. That also gives the grid operator a better way to balance electricity generation and consumption, even in times of little renewable in feed.

**Speaker 1** [00:01:40] And what's that good for?

**Speaker 2** [00:01:42] The aim is to develop algorithms that can find the perfect balance between demand and supply. For instance, you can create incentives for people to consume electricity when a lot of it is being generated. It's about networking everything and defining the rules for making it all work.

**Speaker 1** [00:02:05] I never thought about it like that. Perhaps I'd quite enjoy something along those lines, too. I'd probably have to adjust my algorithms, though.

**Gerard** [00:02:18] What you've listened to is our utopia — the best case scenario, so to say, a potential future world full of collaboration across the energy sector. In all our podcast episodes, we will kick off with a short introduction to set the scene on what a bright future could look like. And then we dive into a discussion on how to get there. Welcome to Decoding the Future of Energy, the podcast by Siemens Grid Software. My name is Gerard Reid. I work in the finance industry with a focus on both the energy transition and the digital energy revolution. As your podcast host, I want to explore a range of options on how we can develop a more or even fully sustainable energy world. Today's episode is all about collaboration and why it is so important for the present and future of the energy system. I had the chance to speak with two great people whose collaboration was recently formalized through a new partnership. The first is Jack Dangermond, founder and president of Esri. Esri produces geo information systems software and is well known, among other things, for its collaboration with Johns Hopkins University on the COVID-19 map. Our second guest is Peter Koerte, the chief technology and strategy officer at Siemens. So, Peter, Jack, really great to have you guys on the show. Thank you very much for coming.

**Jack** [00:03:40] Thank you very much for inviting me.

**Peter** [00:03:41] Well, it's a great pleasure being here with you today.

**Gerard** [00:03:44] Well, listen, may I just kick off with a sort of general question in and around collaboration, because we're going to talk about collaboration and its importance in the whole energy area. But I'd like to just hear from your personal experience how important collaboration is, and maybe, listen, I'll start with you, Jack, on it.

**Jack** [00:04:02] Well, philosophically, there was an old saying that was in the tech industry. It was "collaboration happens at the speed of trust," and I always liked that because, of course, we make technology collaboration, we make business collaboration and interpersonal collaboration.

**Gerard** [00:04:21] And Peter, your thoughts?

**Peter** [00:04:22] Let me add another phrase to this, and that goes, "nobody's perfect, but a team can be," right? And usually, I've seen those organizations really thrive that do not necessarily have the best IP or have the best one talent, but that really work together as a team.

**Gerard** [00:04:42] Can I ask you then, just moving to energy, what I find very interesting about the energy space, and in particular the area of electricity, is it's all based on trust. So, if I look in the European perspective, all our grids are connected together. And what that means is a problem in Norway also is felt in Germany and the German problem is felt in Portugal, right? So the trust is incredible in this system. And Peter, look, I'd love to see it from your perspective being, you know, you guys have been the kings of, if you like to say, electricity equipment for a hundred years, right? So obviously, people trust you, right?.

**Peter** [00:05:20] They do. And you know what? The thing about trust is, you have to earn it over a long period of time. Trust doesn't come just over tomorrow or overnight — you really have to earn it every single day. So, we tend to think about trust as a thing that is called credibility. In other words, you really need to have sound, good technology, and you have to add reliability, that you actually have really good technology, not only that works once, but that continues to work. And then you have that intimacy to customers that really

you understand well, and that you interact with on a daily basis. And that you do over a long period of time.

**Jack** [00:05:59] Yeah, I like that very much, Peter. You know, at the same time, things are changing really rapidly. What we used to talk about just six years ago as a kind of a dream of, you know, distributed energy generation coming into the grid, this idea of solar and wind and personal collectors. And at the same time, you know, electric cars are changing the whole face of the situation and our customers are having to deal with this challenge. And, you know, our field is really geospatial — people would think of it as mapping, but it's really modeling the geospatial stuff in the grid. And the word that comes to my mind just off the top of my head is “interoperability.” That's why I love this partnership with your whole electricity understanding, the grid, all the technology, optimizing the grid, et cetera. And that means working together.

**Peter** [00:07:02] Yeah, you are absolutely right, Jack. And let me let me add to this, because you mentioned that there's so many changes happening in the world, and we firmly believe that no company can do this alone, so you have to collaborate. And so, this is where trust really comes in, because here's the thing: that when we look around us, then we believe that there's seven times increase of the decentralized energy resources coming up. And you mentioned a few things already, so of course, the generation, but then also, in terms of the energy that is being consumed, and in particular also, as you can imagine right now, what's happening in Europe, we get many questions about “how can we accelerate the energy transition?”, “how can we faster move to electric vehicles?”, “how can we increase or how can we ensure the emergence also of heat pumps and the prevalence of it?”, because many, many private households have been converted to gas; now they are moving away from gas to, obviously, heat pumps. And so now that requires additional energy, and so on. So, many are coming and saying, “How can we do this? Because we trust you and your partners, of course, in order to help us to find solutions in a very rapidly changing environment.” So, you're absolutely right, if I'm saying 175 years, that's only because we've been around, but that's not to say that you have to adapt all the time. And as a matter of fact, right now is such a time, where you have to rapidly change.

**Gerard** [00:08:27] I'd like to ask you both a question with regards to trust. And that is, if I look, just as I observe what's going on and the changes that are going on in the energy space and the wider technology area, what you're seeing is, those people that you used to compete with in the past, suddenly you have to cooperate with them. And then it might mean that you have to compete with them again. How do you build trust and keep trust in that type of environment?

**Peter** [00:08:52] For sure. So, what you're alluding to is exactly a phenomenon that we see all the time, in particular when we talk about digital solutions, right? Because their data is being shared very often in these ecosystems. Then you have the gray line between, of course, where do you compete and where do you really share instead of fighting for market share? Quite frankly, everything that's happening in our industry is really vastly expanding the market. So, if you think about adding all the different standards together, then it comes down to how we share the data. And Jack, you spoke about interoperability. Interoperability requires you to be courageous in a way that you open up your APIs, you open up your semantics to ontologies so that others can build things on top. So, do you consider them now as a competitor? I wouldn’t think so. I would think that additional applications that are being built on is just a good way of complementing each other. And this is, besides, you asked, by the way, also from a technology perspective, doing the same thing, Jack, as you did at Esri. We’re coming from a heavy scalar-based, system-

based architecture, now moving all the way into the cloud with our latest grid software solution. And we find that still customers prefer the old way, we find that not only the younger ones, but also those that really have to change that are embracing that way forward. So, openness, in other words, is the only way of doing it. If you compete or not, it really doesn't matter.

**Jack** [00:10:27] Yeah, I totally agree. You know, in the technology area, there's three kinds of companies; I think of them as a triangle. And there's core technology companies that build best of breed in their field, there's solution companies, who build solutions on top of core, and then there are system integration companies that sort of bring core and these solutions together. And you can only actually be one of these kinds of companies.

**Peter** [00:10:54] I like your analogy, Jack, of the triangle. We tend to think in similar ways in terms of infrastructure providers, product providers, and implementers, but put shortly or in short is brick and mortar. And what we think is, we believe in the value of the bricks and we really want to squeeze out the mortar, and this made it so that these bricks really fit together.

**Jack** [00:11:19] There's a term, and you know it quite well, Peter, a digital twin. It's floated around quite carelessly, in a way, these days. It came out of manufacturing in Michigan, where digital twins of cars and aircraft were really pioneered with these sort of 3D CAD systems. But today, the concept of creating a digital twin of a whole utility company is becoming popular. You have a dashboard of the digital twin and everything that moves and changes, outages to new construction, are represented in this digital twin model. This requires, fundamentally, data modeling, and some of it is spatial data modeling — that's where I come in — and some of it is electrical modeling and management modeling.

**Gerard** [00:12:07] So, can I ask you, and Jack, I'll ask you, but I'm also asking you, Peter, as well. It's very interesting, you bring up the phrase digital twin. I want to ask you, from a customer perspective, what does that all mean for the customer, right? So you've got all this data, you've got these digital twins, you know, what's the benefit for me?

**Jack** [00:12:25] So, when I bought my first SAP system, Esri was actually just a $100 million company. But it took us many hours to deliver our order. We operate the company at the speed of light, and that's what SAP really taught me, is the idea of all the different functions of the company can do transactions. So, my company runs much faster. I mean, as we're now a couple of billion dollars in size, but we don't really have any more in the accounting department than we had way back then. So, we've been able to expand because we leverage the power of digital and digital modeling. When I first went to Dong Energy, I had the opportunity to meet with the president up there in Denmark at the time, and he had this model as well, it was just a —. He wanted his whole company to operate, he wanted to be able to have views of the digital twin that showed him operations and in real time where all his people were, how the grid was behaving, where there were outages. He wanted his customer service people to be transactionally updating and responding to situations. I think he had 11 different departments that had views into the digital twin at that time that ran the company, and that's kind of, that was kind of awkward at the time because we had to wire everything together.

**Gerard** [00:13:57] And Peter, your thoughts?

**Peter** [00:13:59] We actually even extend that to the idea of, as we make the grid more intelligent, a lot of hardware that becomes much more software-defined hardware, so such

that you really have the ability to do an upgrade over time, so that you expand the capabilities offered because simply because of the different innovation cycles, right? So, because the hardware, of course, is built into the infrastructure, but then of course software is continuously being updated. So, we see that all the time. Let me add to your point of efficiency two more things. One is reliability, the other one is actually speed, and both go hand-in-hand. So, we've been working with a Nordic grid provider. We were really able to increase the reliability, because you spoke about trust and this is what grid providers are all about, trusting that there will be energy delivered to your doorstep. And so, we were able to increase it to an extent that the grid operators deemed never possible. But the point, though, is, is the way we did this is by being able to respond so quickly and to do all of the simulations, that we did increase that by an order of magnitude, which they thought was not possible. And if you think about many of the grid operators today, they still have paper copies of plans of what they have and where their assets are, if you really think about this, and that's still reality and there's all the software. Now, yet again, it's very important that interoperability comes into play, because if you think about it, we tend to differentiate between IT and OT. In other words, what you mentioned with ERP system, or SAP, implementing it, of course, this is just the IT side, but what we see that the software is coming down now in the operations side, and this S-computing and everything that is arising, the intelligence is going actually decentralized, and also being able to connect it through whatever meshes or whatever you have or the means of communication, eventually you have much, much higher transparency into the grid, deeply into it, than they had in the past. So, the IT and OT is really what we define a little bit of a convergence of the two things that are coming together, and that is an exciting opportunity.

**Gerard** [00:16:22] One of the things that strikes me when I talk about, when I hear the word collaboration in the energy space is, I call it, provocatively, the lack of collaboration with the end customer, because the end customer, up to now, has been treated like a number. He's delivered his electricity, and that's it. And going forward, you've got that energy customer who is actually probably a producer of electricity, and he’s going to use it in a different way, which means the relationship to that customer has to change, which means the nature of collaboration needs to change, because you need to get — you need his data if you really want to go and fulfill the dreams that you guys have. I mean, am I seeing this wrong, or how do you see it? Peter, I'm looking at you firstly, maybe, just to take that up and answer it, then maybe Jack can jump in.

**Peter** [00:17:16] Gerard, you’re spot on, and this is precisely what's happening. So, of course, the first step has been taken with smart meters, so that at least we get a little bit more transparency. What really has changed the game is now, that, as I said, the prosumer, in a way, some producer and consumer, is really not just making unidirectional, but they make it a bidirectional thing. And so, it's very interesting, we see the emergence of microgrids. For example, we are building microgrids in the middle of Brooklyn, in New York, where you would think, that actually, you know, there's enough power in that sense, but no., By the means of technology and partnerships, yet again, and using blockchain and as intermediaries for decentralized orchestration — well, orchestration is the wrong word. Coordination between different consumers and producers.

**Jack** [00:18:11] I'm living here in California. We have many fires burning, actually across the whole west coast of the United States right now. There's fire agencies and organizations like Edison and PG&E, big utilities here in the country are facing the challenges of wildfire, and these are datasets that are outside of their traditional transaction updating of the grid, their digital twin. They live in a broader digital twin. The world is becoming a digital twin. And these agencies, by customers, are building data sets

about land records, cadaster, they're building data sets about fire and spread, about water utilities, about policing, about climate change, about science. These are all layers of information. So, we need to also consider — I think any modern utility has to consider — being able to read in services, like map services, from these other organizations. And, while it's risky and for certain kinds of data, share data out as services. Like, in California, I'll simply say the Office of Emergency Management here and PG&E built a relationship where their map services were shared back and forth, so that they could — you could take care of each other. Now, the great dilemma of our time is the lack of understanding and also our inability to collaborate, and they're interrelated. So, in my field, what's emerging is, maps are becoming a kind of common language that people can not only understand each other, but also collaborate.

**Gerard** [00:19:54] Jack, I love what you're saying. The reason I love what you're saying, and there's two words you keep using. One is collaboration, and the other word is understanding. And understanding is the question I asked about the consumers, I was really asking that because if I look at consumers when it comes to energy, the consumers just don't understand it.

**Jack** [00:20:13] Yes.

**Gerard** [00:20:15] And this has many implications. But one of the big implications actually is on the recruitment side, I think. And the reason I say that, if I look at right across the energy world, whether, you know, there's a lack of installers, there's a lack of engineers, a lack of science guys… right across the energy value chain it's that, and I suppose, I think my reflection is, I think that's because of a lack of understanding by the general public on this. I want to know if you agree with me, and then if that's the case, then how do we deal with this going forward, right? Because you could also argue it's a huge opportunity, and there is this power of purpose in and around the energy transition, right?

**Jack** [00:20:57] Probably you looked at a map of COVID in the last couple of years. We built the mother of all of those data sets at Johns Hopkins. It was the worldwide map of the spread of COVID, you could check. That map has been looked at about 1.5 trillion times, and we still are feeding it about several, two or three billion times a day. It's not just a map of the world, but it's spun off. So, it's one massive system that has created — I would assert that that map created understanding, changed the whole world's understanding of COVID and how it was affecting them. So, this visualization language, we're now working with the White House here in the United States, we just released last week a new website that is all about trying to do the same thing with climate, drought, flooding, fire, heat and coastal zone, you know, sea level rise, educating, educating and getting people to understand what the hell is going on so that we can raise the bar to the same levels of understanding like we did with COVID.

**Peter** [00:22:06] And, you know, Jack, I have to confess that it's such a great thing to be here today, because for many, many weeks, if not months or a year, the Johns Hopkins application that you described, it was my daily companion. I looked at it in the morning, in the afternoon. Of course, we all used it in order to see how are things going here and there and compare and what have you. So, for sure, you really changed the way we actually perceive the world. Now, let me build on what you're saying, and it's very interesting because at Siemens, as you know, we are also in many different fields — and the two that are usually attracting the most talents are the ones that have the biggest purpose, and that is, one of them is healthcare, and the other one is or was linked to renewable energies. Now, if I take the second one, which is a little bit, let's say, in the larger context, most

people today are really fascinated by improving this planet by means of electric charging, electric vehicles and what have you, and they're coming to us because they say, I want to be part of this, and I want to enable this. So, this is what we call technology with purpose. And if you think about, also, our partnership with Esri, as we can tell, let's say, an EV charging company, to say where they should put their charger on the map, right? Because this is exactly it, the power of, the language of geography. I like that a lot. So, if you think about also students and talents coming and using their lifetime, really their lifetime in order to do something good, this is what usually resonates very well with them.

**Jack** [23:53] Yeah, I'm frightened about the future in some ways because I know what's occurring. And both of you, from your own lens, have your own perspectives on it. But I think there's very little time left. We've got to muscle down, put every bit of our science, every bit of our technology, every bit of our creative design thinking onto going carbon neutral, because it's — we sort of overstepped our welcome on this planet and we've got to go all in on it. You know, this COP meeting that happened up in Scotland last year, it was interesting. I don't know if you got a chance to go to it, Peter, but all these venture capitalists came and they sort of watched this stuff and they controlled, you know, trillions of dollars of investment. Also, a number of government leaders like my president's people and your prime ministers, and so, they all went there. They're all now looking at trillion-dollar investments, and the fundamental question is, where do they put their money? So, the science of geography, the science of "where" is all about overlaying this information to pick the right where to locate wind, where to locate solar, where to conserve biodiversity areas, what areas are our, you know, our carbon sinks? Where can we plant a trillion trees? Where can we locate, you know, charging stations? Where can we route transmission lines? It's the science of geography on steroids. It's about bringing all of our collective societies, collective information to integrate and overlay. That's what I call the geographic approach to managing a utility, managing it efficiently, managing it with, you know. Yeah, it's the big thing. Where? And all activities suddenly become seen through a different lens. I know I'm biased, and I apologize for ranting about this, but you just stroked my thinking.

**Gerard** [00:26:11] Jack, what gives me hope is the fact that we've never had so many brilliant people across the world competing and collaborating with each other to find solutions. And so, I'm listening to the two of you guys and your collaboration, and I think, how did you guys even end up collaborating together? Because you come from completely different worlds, but you are. And that's what gives me hope.

**Jack** [00:26:36] I think what you're sort of suggesting, Gerard, is that little by little, people are going to see we don't have enough time to screw around with competition. I don't have that much time left in my life. I want to get on with it and see if there's something that we can really do. And I think you're right. We've got to move and stop horsing around with, you know, those competitive games and get on with it, because the stakes are really, really big. We're living way beyond our means. It's sort of like we're spending bank loans on the future with respect to our natural environment, and it won't take it. I mean, there's this old joke: two planets get together. One is Earth and one is some other planet, and this other planet says, you know, "God, you look really bad. What's wrong with you?" And the other, the Earth planet says, "Well, I got, you know, I got Homo sapiened." And the first planet says, "Well, don't worry about it. It'll pass." You know, I mean, the sort of Anthropocene human footprint dominating nature has gotten — I mean, all of our technical innovation has really allowed us to grow population beyond the means of self-sufficiency or support, and the carbon thing is really at the axis of it. So, I just want to get everybody excited about working on this, Gerard, just like you said, because I think it's a great

mission. It gets everybody excited; it stops the bullshit and allows us to make some progress. And this is all we've got left in life.

**Gerard** [00:28:30] Peter? Anything to add?

**Peter** [00:28:33] Wow. Wow. I think it's tough to build on Jack's perspective. So, if we had a magic wand to just change it overnight, I think we could change it overnight. We did it. We got the islands, the big island in Hawaii to go 100% renewable energy. That wasn't easy, but we built a digital twin of the entire grid in order to facilitate the move over to more inverter-based, because in essence, you need to have inverters because it's direct current to alternative currents. So anyway, but you have to build digital twins to accommodate that, but it can be done. We've done it on small islands like the Galapagos Islands. We've done that on Hawai'i Island, which is good, that's' about 500 megawatts. We can do this, we think, now, for even bigger islands, such as England. And there's nothing that can or should stop us in order to make this work, even for larger continents. So, the technology, this is what I'm trying to express, the technology is there. We have to apply it and we have to do it quickly, to Jack's point, and the energy transition is the key.

**Gerard** [00:29:50] First of all, Peter and Jack, let me say thank you very much for your time, thoughts, experience and visions regarding collaboration in the energy sector. For me, the major takeaway is not only that collaboration is about trust, which needs to be earned every single day, it is also that collaboration is a fundamental element of an ever-changing and probably even faster changing world. Not only collaboration within a company or within partners, but collaboration with the consumers, the current or future prosumers as well, and also collaboration with companies that may have been or even still are competitors. Openness is a key here, as Peter said. Jack also mentioned the digital twin and data modeling, which also come into play when looking at collaboration within the energy sector. Having a shared database can thus highly increase collaboration. By the way, we also mentioned speed in this episode, an absolute interesting topic, which we will cover in a later episode. So, make sure you follow this podcast. If you would like to learn more about everything we've talked about today, I can recommend a visit to the Siemens Grid Software website at Siemens dot com backslash grid hyphen software, as well as the Siemens Smart Infrastructure LinkedIn and Twitter channels. You'll find all the links in the podcast description. If you have any questions concerning the topics discussed in today's episode, feel free to email us at grid dot software dot SI at Siemens dot com.