

POWER PANEL DISCUSSIONS

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Changing Dynamics of Electrical Steel

The following are excerpts from the Power Panel on Changing Dynamics of Electrical Steel with our guest experts Marcel Hilgers from thyssenkrupp Electrical Steel and Ron Harper from JFE Shoji Canada that was conducted live in November 2024.



The whole industry has to decarbonize. I think we all agree in the long term on this question. But the question is, when do we commit and how do we then bring it about?

Marcel Hilgers



Alan Ross: Welcome Marcel Hilgers. You are the Vice President of Customers, Markets, and Technology, at thyssenkrupp?

Marcel Hilgers: That is right, Alan, at thyssenkrupp Electrical Steel.

AR And welcome Ron Harper, you are the CEO of JFE Shoji, Canada?

Ron Harper: Yes, thank you, Alan,

AR Marcel, could you share a little about your role at thyssenkrupp Electrical Steel and your background.

MH Thank you, Alan. I am dedicated to the steel industry and have been for more than 20 years in steel industry, and I have worked with products like carbon steel and stainless steel. But the dearest product to me is GOES, Grain-Oriented Electrical Steel, which I have been working with for more than 11 years. I am in charge of sales, technical customer service, marketing and public affairs for our company for one product, GOES, which we produce in our three global factories.

AR Excellent. Thank you. Ron, give us a little bit of background and current role?

RH Thanks, Alan. As you said, I am currently with JFE Shoji in Canada. Our business used to be Cogent Power. Many

people knew that name for almost 20 years. We were acquired by the large Japanese steel firm, JFE, back in 2019. We have been in the industry of electrical steel and electrical steel products for almost more than 50 years, and always in Canada serving the North American market for our materials and products. This is a very niche product with a handful of producers in the world, so there are a lot of international connections. We have worked with and continue to work with every steel mill that's making GOES in the world. I am happy to be here today.

AR When we first decided on the content and guests for this Power Panel I thought, 'Are these two competitors, or are these two collaborators?' What is the relationship between JFE Shoji and thyssenkrupp Electrical Steel?

RH I'd start by saying we are collaborators. We have worked very closely with thyssenkrupp for many years on supporting the supply chain and the demand for electrical utilities, with our focus in North America, but also thyssenkrupp has a much wider scope around the world. We have worked quite closely in terms of the supply chain using thyssenkrupp for materials we use in the finishing products that we produce for North America. I think collaborator is what I would start with. But also, I think it is important to know that even though our company, JFE Shoji is connected with JFE Steel by common ownership, our business focus is on processing



electrical steel, not making it. And so, we buy from all material suppliers.

Since our relationship with thyssenkrupp is synergistic and also a customer-supplier relationship, collaborator is how I would describe it.

AR Excellent. Synergistic. Do you have anything else to add to that, Marcel? Is that a good definition of the relationship between the two of you?

MH Yes, absolutely. It is a complex and dynamic world we are living in and while JFE is a competitor of ours, JFE Shoji is a customer.

AR Before we talk about Transformer Steel, you have both been in the industry long enough and you are smart enough to look at the industry as a whole. What do you see going on? Ron, what do you see going on within the power industry, primarily in Europe, UK and North America?

RH What is going on in our industry, or the things that keep CEOs up at night? (Laughs) The first thing that comes to my mind when you talk about the industry in general, especially if you look at Europe, UK, and North America, is that we're in a real significant shift. The supply chain and manufacturing of transformers is in about a 20 to 30 years of slow decline, because most of our electrical grid in

both Europe and North America was produced after the Second World War, and it didn't need to be expanded too much. But now, with the advent of artificial intelligence and data centers demanding so much anticipated electrical energy in the future, and with transportation systems, EVs, et cetera, the demand in the regions is growing so significantly and so quickly that our industry has gone from a market that was stable to slow decline to one that's rapid growth overnight.

This change requires a completely different mindset and shift, both in terms of how you run your own business, but how you actually work with your suppliers, partners, and clients through that.

You need to take a much longer term, a much more strategic approach, a lot of investment to grow 20, 30, 40% in terms of what our demand is going to need.

AR Great clear and concise perspective Ron. Marcel, comment on that or any differences you see in Europe.

MH I think you really cannot, in the world of GOES, distinguish between these different markets. GOES is truly a global business. This energy transition is happening everywhere around the globe, not only in Europe and North America, but everywhere.

If you think back, we have been talking

about the energy transition for many years in the 2010s and beyond, but nothing was really happening. It was this slow decline all the time. But for a couple of years now it is really happening. You see it, you see projects implemented, you see the demand for transformers really taking a stable move upwards. I remember in 2006 and 2007 there was a boom in the transformer and electrical steel industry. And I always ask myself and the people around me and experts, is there something different right now compared to back then? Is there something which makes us believe that this growth is more sustainable? And the opinion of everyone I am talking to is really - yes, this is different now. It is the energy transition that is happening. It is not a boom which is going to crash.

RH I think it was the energy transition, but the challenge was that the energy transition was going on in China back then. The Chinese demand was so ferocious with very limited production capacity for electrical steel, for example. That was just supporting the electrical transformation in China, primarily. That is what happened then. Now, this is an electrical transformation supported by changing societal trends on electrical transportation. And it still boggles my mind how much electrical energy is going into the Internet and AI-type technologies. It is just almost unbelievable.

AR Marcel, does thyssenkrupp make only GOES?

MH We focus solely on GOES, Grain-oriented Electrical Steel.

AR What are the issues concerning amorphous steel and GOES, Ron? I am not sure everybody is aware of what they are.

RH Well, I think it first starts with what's driving the conversation, and that is the desire for more electrical grid efficiency. The question then is, how do you actually help make the grid more efficient? One of the ways to do that is to make the electrical transformer more efficient.

The DOE has launched new efficiency legislation to be put into place in 2029, and that efficiency legislation will, at today's technology, drive an increase in the usage of amorphous metal, particularly in some styles of transformers. I think, nominally, most people say that it will be more for distribution transformer market share for amorphous metal up to somewhere between 20 to 25%, depending on how OEMs and utilities work out designs. Just one of the reasons that we are such a large processor of amorphous metal today is because the Canadian market has shifted to that level of efficiency standard and no-load losses a number of years ago. The market share in Canada for distribution for amorphous metal is actually high. The real issues are the availability of amorphous metal to support that standard, the investment that needs to go in by producers to support that standard, and how are those investments and agreements going to be put in place so that we



We are not just talking about our business's financial value or thyssenkrupp's financial value. We're talking about creating value through the entire supply chain, to the utilities, to the end users, to our OEMs, and really to the electrical consumer. As long as we stay focused on that as our primary mission, it tends to solve a lot of problems along the way.

Ron Harper

can achieve the desired efficiency outcome according to the DOE in 2029.

Having said that, there are efforts underway on most, if not all, advanced GOES producers to continually make the GOES product better so that it comes closer or can meet the DOE standard in the USA. It is really driven by an increasing efficiency standard and the available core materials that are going to support that standard 3 or 4 years from now. The general view is that it is going to be a mix of improved GOES and amorphous metal.

But the question still surfaces then, how is that available? You are pushing the most efficient, green-oriented electrical steel. How much of that is available to the market, and how much amorphous metal is available to the market? Because both of those are pushing the efficiency curve or the performance curve of the material very hard in an environment that is in very, very high demand. So there needs to be investments, whether you're producing better GOES or producing amorphous metal to be able to support that demand for higher efficient transformers.

AR Marcel, Ron just said something that was interesting: more efficient GOES. Is thyssenkrupp working on that? Are you becoming more focused as a company on providing that?

MH Yes, absolutely, Alan. We, as a GOES manufacturer, have predominantly

three jobs to do. The first thing is that we have to make a better product. This means lower loss material with better magnetic performance and noise performance, as bigger transformers are getting closer to where people live. The second point is that we have to accompany the growth of our customers because everyone is working at full capacity, and everyone has growth plans. And the third thing we have to do is decarbonize the production, or we have to change our production methodology into a sustainable way. These three things are on our agenda.

In Europe we also have what is called the Eco-design Regulation of the European Commission. There is currently discussion about Tier 3, so the third revision of it. We are also participating in the meetings and the hearings to give the regulators our view on what is realistically possible from a manufacturer of GOES perspective.

We are providing market data as much as we can from public sources to demystify what is available and bringing in some realism about what can be achieved. In Europe, the consensus seems to be that for small distribution transformers, efficiency regulations are unlikely to tighten further since they already require very high-quality GOES. Amorphous is not a topic in the discussions. It is discussed, but people see here that it doesn't make a big difference here. The reason is there's a different landscape of transformers used here, and also a different distribution system. We assume that the focus here will be more on top grades of GOES.



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Ron Harper

We call these low loss GOES grades. This is happening in many markets, especially in China. We are expecting next year a new, Eco-design regulation coming up, which will consume probably a lot of top grades in China again.

AR Do you think the industry today is considering that, as everybody is adding production and growing, the next possible marketplace disruption is going to affect what you're doing? Will something like the 2008 Financial Crisis and Covid affect markets? Are people cautious about that or is it full bore ahead, whatever happened then is not going to happen again?

MH What we are seeing is that the consumption of GOES, the CAGR is somehow disconnecting from the gross domestic product development or other indicators. This is because of the energy transition, actually. We have to transform the system no matter what the economy is doing. We have not seen a slowdown, for example, over COVID; not really in our industry.

But to come to your point, are we prepared for disruption? One keyword is coming up more and more in my discussions with our customers and their customers, with transmission system operators, utilities, and that is resilience. Are we prepared in our supply chains from raw material or core and lamination manufacturers to transformer makers for global disruptions? I see much more trade disruption, global crisis, wars, and so on. This is what is really going on where we should be concerned about.

RH I think I would agree with Marcel that the industry and just the clean electrical energy I think I would agree with Marcel that the industry and just the clean electrical energy transformation we're going through has decoupled us from general economic cycles. I would agree completely that the two main issues that I think most people

are wrestling with are firstly building resilience in their supply chain, and secondly figuring how to invest to grow. There are obstacles to investment, especially in the Western markets like Europe and North America.

Some of those obstacles have been high interest rates of late. And the other big thing is we are not talking about small growth here. We are talking about a very large double-digit growth in terms of the whole demand for electrical equipment and transformers. And trying to get the entire supply chain to grow at the same pace is very, very difficult. A power transformer has hundreds of components. If all of those suppliers don't grow at the rate the demand does, then it is a bottleneck to growth. It is a little bit, as you said, full steam ahead, but it's full steam ahead where you have to work closely with your partners to make sure everyone is growing at the same pace and same time and investing at the same pace and same time.

AR And that can be a really big challenge. Marcel, you brought up decarbonization which is a big thing. I know thyssenkrupp has made a significant commitment to decarbonize. I mentioned that in an interview a couple of years ago, and the guest said, "There is no way that a steel company is ever going to think about it." They need too much power to worry about that. Talk a little bit about that commitment from thyssenkrupp and where you are with it now.

MH Yes, it is a commitment, absolutely. But overall, it is do or die anyway. We have to decarbonize, otherwise, nobody wants us to be producing in Europe anymore. The whole industry has to decarbonize. I think we all agree in the long term on this question. But the question is, when do we commit and how do we then bring it about?

What we are doing is that we are currently in the process of building the first direct reduction

plant to make iron, virgin iron, not with coal anymore, but with hydrogen, green hydrogen. The construction site is currently operative. So, we will have this first direct reduction plant in our mother company, steel mill in Duisburg, up and running in the year 2028.

AR Green hydrogen? So, you are using wind and solar, hydrolysis, and then you are making green hydrogen and using it that way. Is that where you're doing?

MH Yes. We're not making the hydrogen ourselves, so we are sourcing it. There is a pipeline network currently constructed, and it's not too far away anymore. We are currently engaging in negotiations with big energy companies, mainly on the hydrogen supply contracts. We are solving this chicken and egg issue, because there is no availability of green hydrogen in the world for a big offtaker. The energy companies would not make any investment if there were not the guarantee to have a big customer. We are working to support this transition to the mandatory use of green hydrogen in the future.

AR Ron, let's switch to North America, what is going on in North America as it relates to green, if anything, or hydrogen for a fuel source?

RH I am not an expert to talk about green hydrogen, but in the energy transformation that we're making it is to clean energy sources, especially on large users like steel manufacturing and other large industrial consumers of energy. Liquid hydrogen is an absolute necessity because you just cannot generate enough material, or you cannot generate enough energy by using electricity alone to do that. In terms of its impact on GOES and electrical steel, producers in North America, Europe, and around the world need to spend trillions of dollars to be able to achieve the clean energy targets they need to. In the end, we are working very closely with our suppliers and partners to make sure that we are advocating for those investments for clean energy for GOES, because without end users investing and providing the means for that, producers are never going to be able to convert to green electrical steel. In the end, that is going to have to be paid for by end users in those investments. And we're working very hard to promote green steel like the product that thyssenkrupp is making available to the market.

AR When I asked earlier, 'what was the relationship between your two companies?', the first word both of you used was collaboration. How can two global

companies, two recognized companies in the marketplace; one with a parent who is a competitor of the one who is the supplier, make it work? Marcel, what do you think the most important collaborative principle was?

MH Shared values.

AR Shared values. I like that. The shared value had to be a commitment to something bigger. Ron, your thoughts?

RH That would have been the first one I gave. The second one, I think, needs to be having an open dialog.

MH That is a very good number two. Overall, for a collaborative atmosphere, a collaborative way of working here, it needs to have the same passion for driving value for the end customer in the end, which we have. And collaboration only makes sense if we are creating value for the transformer maker, for the OEM, and their customers in the end.

RH If I can just add to that point, when we talk about value. We are not just talking about our business's financial value or thyssenkrupp's financial value. We're talking about creating value through the entire supply chain, to the utilities, to the end users, to our OEMs, and really to the electrical consumer. As long as we stay focused on that as our primary mission, it tends to solve a lot of problems along the way. Combining that with open communication and a common mission, I think those are really the big recipes. We don't always agree, and we need to be open to work through those issues. I think that is also a part of it, that you must have a commitment to work together to find a resolution to challenges or conflicts that you have.

AR Excellent. Ron, what were some of the barriers and challenges in working together that you saw that you can help others who are trying to collaborate with their suppliers or with their customers in a way that they're trying to bring about something of value?

RH I think there are a couple of things that come to mind that disable collaboration. I think the first thing that disables collaboration is self-interest. If I am more interested or only interested in what I need, or what my business needs, or what my finances are, and I don't care about Marcel and thyssenkrupp's financial health, then that is a big obstacle to collaboration. I think the second

one, equally important, is when you negotiate terms, prices, whatever, if you play one supplier against another in that supply chain; that can also be a disabler to collaboration.

AR Marcel?

MH I agree with what Ron said. He said something earlier as well. It is this growth we have to accomplish together. We are coming out of a decade and more of having losses in this industry. Transformer OEMs, steel makers or GOES producers, all of us. You could say we are coming out of some tough times. Now it is time to grow together, and we all somehow forgot how to grow and what it means, especially as we are now coming into a time where there is enormous growth ahead. We can already anticipate that there will be supply chain issues along the way. The ones Ron mentioned, if somewhere in the chain there is a missing link, that creates issues for all of us.

On GOES, here is my perspective as a producer, which is based on public data. At this moment, there is a global installed capacity of GOES of around 4 million tons, and nearly all GOES makers are producing at full capacity. Transformer makers are operating at, in many cases, full capacity as well, with the exception

of China and some in Southeast Asia. But there are huge investments needed coming up. I do not think that we will have sufficient GOES in the market over a certain period of time. If we look at the projected increase in investments in the grid globally, especially in North America and Europe, then the like-to-like comparison is that by the year 2050, we need more than 9 million tons of GOES in the market. Who is making the needed investments right now? It is very, very slim, and it's a very expensive thing. Also, the know-how needs to be there. Let's stop the old way of doing business and competing, but rather think strategically into the future and how to create the needed resilient supply chains, the sustainability supply chain, having the top grades in place. That is what we have to talk about.

AR Resilient supply chains are one of the things, in North America and especially in the United States, it does not matter who will be President (*At this writing Donald Trump was elected President.*), everybody agrees on this. We needed to “de-china-ise” our supply chains. Covid taught us that. Covid was a real eye opener in terms of getting supplies. Chip makers, everybody is doing that, particularly for transformers. We no longer bring as many transformers in, if any, from China.

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Marcel Hilgers

Marcel, you said we are moving from 4 million tons to 9 million tons. How are we going to do that?

RH If I can start, this is both from mill production of GOES and processing capability. This is where I think collaboration is so important, and I don't think it's just industry collaboration. I think there needs to be leadership from government entities to set the path forward for the transition to clean energy technology. Otherwise, the investments are just going to be too slow. Marcel talked about that just now. We have 4 million tons of GOES produced today. And really, outside of potential Chinese additional investment from existing producers, the only investment that is going on right now is JFE Steel and JSW in India, and that's really mostly intended for the Indian market. So, if you look at that, there isn't really enough that's being considered today for investment in GOES in Europe, North America, et cetera. And why is that not happening? It's not happening because we lack a clear vision five years from now or ten years from now. If I was going to spend a billion dollars to invest in a GOES production facility, the question is if the path clear enough for me to make that investment worthwhile.

I just don't think there is enough leadership to make that long term investment clear.

We are all owned by private companies that our shareholders expect us to make a return on the investments they make, and they don't expect a return sometime in the future, they expect a return when that asset is put into place. And this is the challenge that I think both Marcel and I have been talking about, about industry growth. How do we grow the entire supply chain of electrical steel, other components for transformers, with the capacity to produce power and distribution transformers, and the ability to install those transformers? How do we grow that at the pace that the electrical demand requires and the path that we're on? How do we grow those with sensible investments from all the players in the supply chain so that we satisfy the demand in the future and satisfying our shareholders that we're making good business decisions and investments.

AR Gentlemen, I would consider both of you rock stars of our industry, so thank you very much for your time and insights on this important topic.

MH Thank you, Alan.

RH Yes, thank you, Alan. It has been a pleasure.

Editor's Comment:

For more on this topic please go to <https://www.powersystems.technology/community-hub-pst/apc-power-panels/power-panel-discussion-changing-dynamics-of-electrical-steel.html> to view the complete Power Panel in our YouTube Channel.

