Shaping the future energy system

A discussion with HELMUT BOCKSHAMMER

Global Product Group Manager for Components & Services for Hitachi Energy's Transformers Business

Decarbonization is transforming global energy systems; it is accelerating the shift from fossil-based power generation to renewable and carbon-neutral alternatives.

In the global power system of 2050, we will need around four times the power generation capacity and we will need to transfer up to three times as much electrical energy compared to 2020. Electricity will be the backbone of the entire energy system and the urgent energy transition requires us to collaborate across stakeholders and sectors. To meet the rapidly increasing demand for electrification by many new and existing segments like transportation and industry, the grid as it is today needs to expand and evolve.

The energy transition requires the acceleration of new investments, collaborations, and business models to expand the grid and enable greater access to sustainable electricity. It is also incumbent upon OEMs and manufacturers to boost innovation, technology, and their capacity to cater to the growing demand for key equipment such as transformers. Therefore, leading manufacturers like Hitachi Energy are developing their offerings to meet the demand for sustainable technological solutions that incorporate sustainability across all their value chains.

A few weeks ago, we had a conversation with Helmut Bockshammer from Hitachi Energy, discussing the evolution and challenges faced by the transformer industry in advancing a more sustainable, carbon-neutral future. Here is an excerpt from our talk.

Hello Helmut, thank you for joining us. You have been in the transformer industry for many years now. Tell us a little about yourself, your background, and any recent transformers-related initiative.

Indeed, time flies! I started my career in the Medium and Low Voltage businesses in 2008, working in various roles such as Product Marketing and Sales, Business Development and Product Management – including assignments to India and several years in China – before joining the Transformers business unit in 2018. Since then, my focus has been on scaling up our service business by driving the company's global capability to offer and deliver a wide range of life-cycle services.

On the component side, my focus is on regionalizing the company's capabilities and ensuring a more globalized manufacturing footprint. This keeps us closer to our customers, equips us with the right portfolios, and enhances our ability to provide a great customer experience.

A few notable recent examples are new service centers in the UAE and India; investing in service workshops in Norway and Australia; and starting AirRIP® flex dry bushing production in China, India, and Brazil. In this period, we also released new products and services, such as the EasyDry® paperless bushing portfolio, EnCompass™ service agreements, and the TXpert™ HUB with CoreTec™ 5, the latest addition to our TXpert™ Digital Ecosystem.

Therefore, to say the least, we have been keeping busy in the past years – and given the future trajectory of the industry, this may only be the beginning!

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You have closely observed the evolution of the power grid over the years, specifically the change in the transformers industry. What are the key challenges that operators, asset managers, and transformer manufacturers currently face all over the world?

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I believe this moment is a great opportunity for all stakeholders to contribute to the much-needed decarbonization process and enable a more sustainable energy future by driving electrification for society. Of course, the challenges vary according to the roles we, or our customers and partners, take on to realize this opportunity.

For example, the energy transition needs to be accelerated, demanding tremendous effort from regulators and authorities to create the right conditions for this to occur. With renewable energy increasingly entering the grid, the existing grid needs to be expanded – not only with new transformers but also by upgrading existing ones with the newest technologies to cope with all the related changes.

On the one hand, the existing infrastructure is aging while maintenance budgets are not necessarily rising. On the other hand, novel challenges are continuously emerging, such as ensuring cybersecurity, em-

bedding EV charging, or making grid connections for new players like data centers.

On the manufacturing side, we are facing a demand surge in some regions while expected lead times for deliveries remain the same, and this requires investments for capacity enhancement. At the same time, the pandemic and the recent geopolitical conflicts have placed a lot of stress on the supply chain.

A common challenge for everybody in the industry is the shrinking skill pool and availability of people, as many technical experts are in their retirement years. This makes it more important for all stakeholders to ensure good knowledge management and to work with reliable partners like Hitachi Energy.

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We know that Hitachi Energy is serving its customers both as a transformer manufacturer and services provider. But a part of your responsibility is also the transformer components, and we would like to explore this area further.

Can you provide an overview of the components portfolio and how it adds value to your customers?

As you correctly said, Hitachi Energy is not only a transformer manufacturer, but we also have a strong focus on providing an integrated service offering for our customers. In addition, in the transformer business we offer a comprehensive portfolio of power and distribution transformer components, which can be used by our customers, suppliers, and other transformer manufacturers as well. The portfolio includes bushings, tap-changers, insulation materials and kits, and conventional and digital accessories.

Having such a broad and comprehensive portfolio allows us a wider perspective when thinking about our customers' needs. It is Hitachi Energy's aim to provide a 360-degree product range and holistic support to customers, helping them reduce the complexity of their daily operations.

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Our teams of experts, distributed across all our manufacturing locations, have the experience and expertise to offer customers full engineering-to-order solutions, customized bundling solutions and simplified and cost-effective customer procurement and logistic processes. For more than a century, we have been a trustworthy partner to all our customers, and our aim is to continue to earn this trust with humility in every interaction and delivery while continuing to invest and grow.

Having said that, it is also clear that as an industry, we cannot continue to work as we did in the past, especially when all the challenges I mentioned earlier are considered. All stakeholders will have to collaborate more closely, going from transactional business toward relationships and partnerships, timely and more automated data interchange within value chains, and driving open innovation and co-creation for the development of new products or services. Without this collaboration, it will be extremely difficult, if not impossible, to reach the speed and scale needed to enable the energy transition.

Speaking of the energy transition – what is your view on the existing infrastructure and the role of services?

As I mentioned earlier, a big part of decarbonization will be the electrification of society, meaning electricity will be the backbone of the future energy system. And, of course, the future system must be built on the existing one.

The current infrastructure, like the fleets of transformers in grids, are aging, and this is a concern especially in developed countries where the average age of the installed fleet is the highest, and where the ener-

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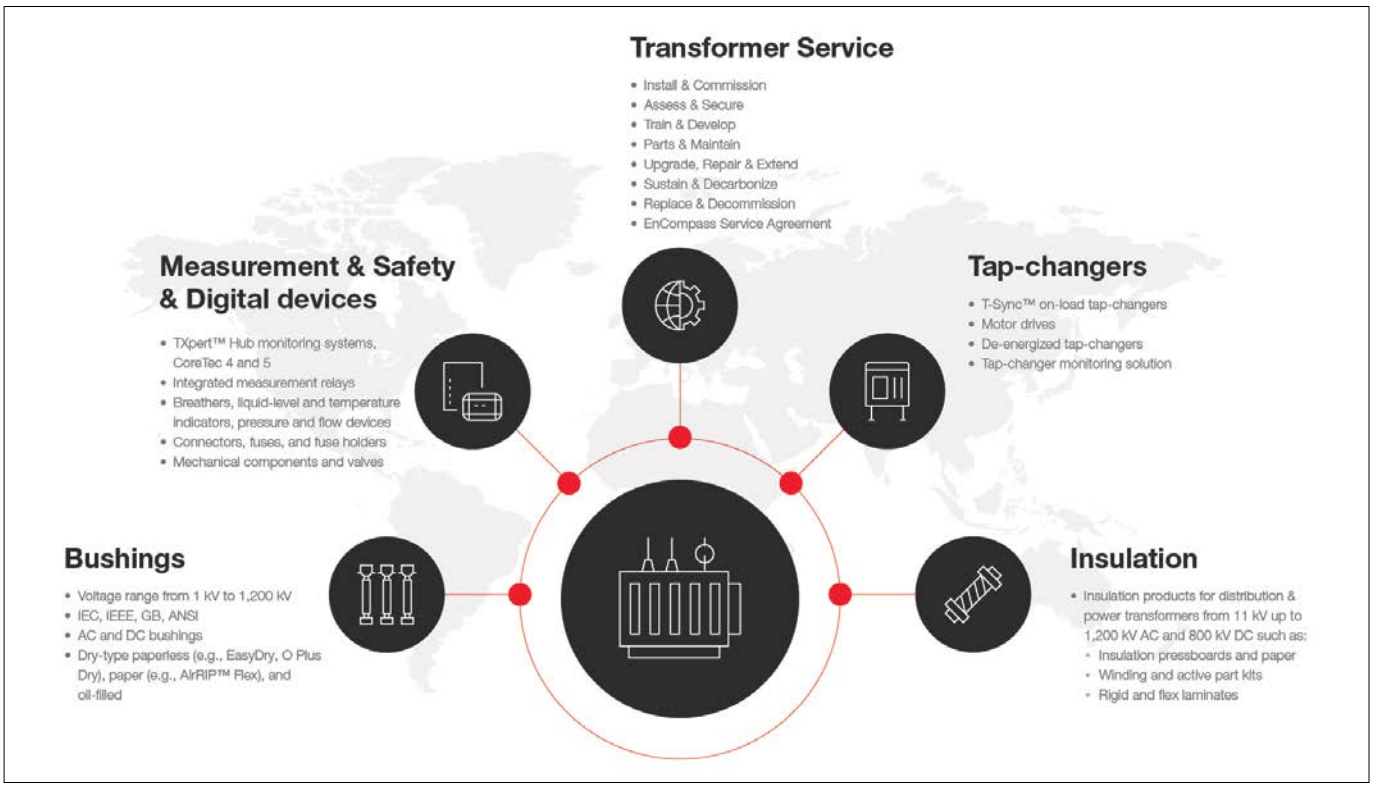

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gy transition is happening the fastest. Therefore, service plays a major role in supporting our customers and partners in their journey to make their infrastructure and operations ready for the future. Traditionally, our service centers were contacted to tackle unforeseen outages, repairs, spares, or to support maintenance activities, and we continue to offer all those services.

But what is becoming more significant now – partly due to regulations, sustainability considerations as well as lead times – are upgrades, retrofits, and midlife refurbishments that extend the expected lifetime of the transformer considerably. This can be done, for example, by replacing oil bushings with dry bushings, upgrading from conventional to vacuum tap-changers, replacing secondary systems like gaskets, valves, and pumps or equipping the transformer with digital capabilities.

We are entering into **service agreements** with select customers to provide regular support and enable rapid response action in case of unforeseen occurrences. Last but not least, **condition assessments and consulting**, with and without digital technology, are becoming more important and are capturing the interest of customers, so we support them in analyzing the health of their transformers – single, critical ones, or the whole fleet – to identify the actions necessary and prioritize the maintenance work for the coming years.

Can you elaborate further on the role of digitalization in the energy transition and how digital technologies can help in practical terms?

When we discuss the energy transition, we often focus on the energy generation shift from fossil fuels to renewable energy sources. This is certainly important, and because of the integration of renewables and the electrification of society, by 2050, the electrical power grid will need to increase in size and transmit three times the amount of electricity compared to today. It is however often overlooked, that the future grid is not just set to become larger but much more complex.

Sustainable energy integration increases power system complexity, creating the need to optimize energy both locally and system-wide, leading to a complex **"system of systems"** that must be integrated and managed.

Digitalization is crucial to manage this complexity, simplifying the contextualization of massive amounts of data. But this must be balanced with managing and optimizing today's operations. Hitachi Energy is helping its customers navigate this increasingly complex energy landscape. We have the right combination of connected products, software-based solutions, and digitally enabled services to solve such challenges.

Other opportunities are in maintenance practices - for example, enabling a shift from time-based to condition-based cycles, and the ability to monitor remote or offshore assets with high voltage energization levels with sensors, or conducting

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camera-based and robotic inspections. Coupled with IoT-services, such monitoring systems can help identify trends and prevent failures, hazards, or harm to human-health.

Digitalization will also change the way we work as traditional service offerings (such as spare parts) will be procured through self-service portals; over-the-phone support can be enriched with virtual-reality; workforce-dispatch is effortless with software-powered tools; and customer support agents will utilize AI-copilots to solve problems for customers in any language worldwide.

Taking the focus back to transformers specifically, some of the major benefits of digitalization lie in obtaining insights on remaining asset life and avoiding unforeseen outages. The "Transformer reliability survey" from CIGRE Working Group A2.37, in 2015, found that the top three locations of faults in transformers are its windings, tap-changers, and bushings. Failure of bushings can lead to transformer tank rupture and explosions, resulting in millions of dollars in repairs and settlement costs, while the cost of replacing a high-voltage bushing would have been a mere fraction of that amount.

This is why the TXpert™ digital ecosystem has been released and is continuously developed. This ecosystem enables us not only to deliver TXpert™-enabled transformers but also to upgrade existing transformers with digital capabilities or provide components with corresponding monitoring systems.

Leveraging our domain expertise on transformers, the TXpert™ ecosystem is designed with an open, scalable, secure, and vendor-agnostic approach. Our aim was to enable our customers' digital journeys and avoid limiting them to only our own transformers. We wanted to give them the opportunity to flexibly deploy the ecosystem in new transformers or in transformers of their existing fleet from Hitachi Energy or other manufacturers. There is a wide range of options available, from simple hot spot monitoring with on-premises analytics to a full-fledged

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system including the DGA, tap-changer, and bushing monitoring, with cloud connectivity and remote monitoring. CoreTec™ 5, which is the heart of the TXpert™ HUB has been certified in accordance with the latest cybersecurity standards. Multiple vendor devices, such as DGAs, have been integrated; our focus is not so much on selling specific devices but is a bid to gain the flexibility to deliver a customized system that matches our customers' needs. But of course, making the transformer digitally capable is only the first step.

What would be the next step after obtaining digitalized assets?

The data must first be analyzed and interpreted to derive actionable insights. This sounds simple, but in practice this is where many organizations struggle: due to a lack of expertise, poor data strategies, inefficient tools, or a combination of these factors. Building on digitalized assets, Hitachi Energy provides services and software to support its customers and partners in the next steps in their digitalization journeys.

For instance, Lumada APM (Asset Performance Management) can be deployed as an Edge solution not only with a single, or small number of transformers, but

also as a full-fledged on enterprise level. This will enable our customers to gather data from their entire installed base (not just transformers but all digitally enabled assets) into a central system, establishing a clear overview of their health status, and supporting maintenance planning. In this way, they can make well-informed, data-driven decisions and optimize costs and resources.

Alternatively, we can provide analytics at the Edge, or simply offer support to analyze offline data with our transformer experts and define a "health plan." When it comes to deriving actionable insights from asset data, there are different options available to match the specific requirements of our customers.

Of course, the more consistently digital technologies are deployed, the higher the benefits: we are used to performing analysis from data extracted only by critical transformers in a specific time range (once per year or so), while having digitalized assets allows us to have continuous real-time monitoring of entire fleet of transformers. Such continuous monitoring helps avoid unforeseen outages, prioritize work, and thus optimize operations, extend asset life, and reduce life-cycle costs.

To summarize, digitalization is a clear trend and can unlock a lot of benefits, and we will continue to develop and deploy the TXpert™ ecosystem to support our customers' digitalization journey.

We talked about advancing a sustainable energy future for all: what about the people needed to achieve this vision?

People are of utmost importance. As discussed earlier, with the expansion of manufacturing capacity and an aging workforce, it is crucial that we continue to develop our existing workforce in addition to absorbing and nurturing new talent. The younger generation must not only take ownership of the existing know-how but also question the status quo and exercise an innovative mindset that will carry us all forward.

As a pioneering technology leader, Hitachi Energy has to keep evolving. As the world keeps on turning, we need to find new ways of working and innovating, and with the right people to advance a sustainable energy future for all.

In this context, we recognize the importance of diversity, equity, and inclusion – for the appropriate working conditions and environment, and also as a lever for innovation. I firmly believe true innovation comes through collaboration with diverse colleagues, people from different walks of life, genders, ages, and cultures – to bring fresh ideas, to question the status quo, and to challenge us with their unique perspectives with the right motivation, skills and experience to thrive in our dynamic and environment. I know this sounds theoretical, but my Global Product Group management team is a great example – not only because of the outstanding female leaders but also because of the diverse age and cultural composition of the team, with people from various countries like India, Germany, Sweden, Brazil, or Canada (to name a few). The only challenge is that sometimes it can be tricky to find a suitable time slot to come together in a virtual meeting (*laughs*).

Overall, our company culture continues to be organically shaped by over 40,000 talented colleagues and friends who work and think globally and provide technical solutions that span cities, countries, and continents. We connect the world's largest wind farms, bring energy to mass transportation systems, and protect our biggest cities from blackouts. Such purposeful innovation fuels our purpose of advancing a sustainable energy future for all.