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Striving for a renewable energy future

Interview with Juan Pedro Gracia, Global Renewables Segment Leader at Hitachi Energy Transformers

The global shift towards renewable energy is transforming the power industry at an unprecedented pace. As countries and companies work in the direction of decarbonization and energy security, wind and solar energy sources are becoming key pillars of the modern generation landscape. This transition presents both opportunities and challenges, particularly for critical infrastructure like transformers, which play a vital role in integrating renewable energy into the grid.

It is expected that the global power system in 2050 will require four times today's generation capacity and will need to transfer three times as much electrical energy. This rapid expansion is being accelerated by an increase of the global energy demand, which has propelled unprecedented momentum for renewables. As a result, renewable energy is expected to surpass coal as the largest source of global electricity generation by early 2025. However, this transition requires a new energy system approach — one that relies on a larger, more interconnected, and increasingly complex grid.

To gain deeper insights into these developments, we have interviewed Juan Pedro Gracia, the Global Renewables Segment Leader at Hitachi Energy Transformers. With extensive expertise in transformer technology in

the renewable sector, Juan Pedro shares how Hitachi Energy is addressing the challenges of renewable integration and contributing to develop the future sustainable grid.

Welcome Juan Pedro, thank you for joining us today. To start, can you tell us about yourself and your current role at Hitachi Energy?

Thank you for this interview. My name is Juan Pedro Gracia, and currently I am the Global Industry Network Leader for the renewable segment at Hitachi Energy Transformers.

My primary task is to support the renewable energy transition by ensuring that our transformers evolve to meet the demands of wind and solar power generation. I work closely with our customers and stakeholders within this industry to understand the technical and operational challenges they face and so that Hitachi Energy can help to deliver transformer solutions that enhance the efficiency and reliability of renewable generation and the grid.

I have been working for the company nineteen years and spent almost fifteen dealing with renewables. During this time, I have

covered several functions within the renewables energy sector, mainly related to the on-shore wind turbine OEMs and distribution transformers: from business development to account management. But also, I have been involved in the development of our current structure for the solar segment, which is a very dynamic and fast-growing business experiencing quick evolution due to the hybridization of power plants and integration of different energy sources.

Today the focus is much wider, covering not only solar applications but also onshore and offshore wind, from the transformers at the wind turbine and solar inverter generation to the collecting power transformers at the substation and connection to the grid.

Hitachi Energy has a long history of innovation in the energy industry, and we see transformers as a critical component and a relevant asset of a successful renewable energy transition. Whether for offshore wind farms or large-scale grid connections, our mission is to develop reliable, sustainable, high performance transformer solutions that will enable the carbon neutral energy system of the future. With our unmatched global installed base combined with our deep expertise and long experience, we are uniquely positioned to support any electrification pathway at speed and scale.

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You mentioned a trajectory of 15 years in the renewables sector at different roles within wind applications, interacting with global and local wind players across different regions. Where are we standing now? Are we ready to shift away from fossil fuels and scale up clean energy sources?

From my point of view, we are in a better position, the baseline is strong, and the adoption of renewable energy sources is accelerating, worldwide; however, we still face significant challenges to ensure a smooth transition and grid integration. The sector is dynamic and does not evolve isolated from the surrounding environment, no matter if it is business, new trends or geopolitical situation.

One of the primary challenges is grid stability. Unlike traditional power plants, which provide a consistent and controllable energy output, wind and solar power are intermittent in the production and depend on weather conditions. This variability creates challenges in balancing supply and demand, requiring advanced grid infrastructure, digitalization, and energy storage solutions to ensure stability.

Another major challenge is the development of the infrastructure. Wind farms, particularly offshore, require substantial investments in transmission networks to transport energy efficiently over long distances to consumption centers. Offshore substations and

transformers must consequently withstand extreme conditions while ensuring reliability, efficiency, and maintainability.

Despite all, the transition is happening faster than expected. Renewable capacity expansion is exceeding projections, and by 2025, renewables will become the largest source of global electricity generation, surpassing coal. This growth highlights the need for sustainable products and solutions, power electronics, and digitalization — key technology areas that are fundamental to enabling the evolution of the power system.

How is Hitachi Energy addressing these challenges?

We have just indicated some of the main tasks that we have ahead and the need for sustainable products and solutions, power electronics, and digitalization. At Hitachi Energy, we listen to the market, our customers, and relevant stakeholders, and we are fully committed to providing innovative solutions that address these challenges and support the rapid expansion of renewable energy.

Our transformer solutions are specifically engineered to handle the fluctuating power output of wind farms. We integrate advanced insulation systems and cooling technologies to operate under severe working conditions to ensure stable generation even under variable loads, improving grid reliability and minimizing energy losses during transmission. There is no standard design for such an application, we develop products and solutions based on our knowledge and experience combined with a process of co-creation together with our customers.

In offshore wind for instance, where footprint (space and weight) and operational challenges are critical, we are developing compact and lightweight transformers for the offshore substations. These solutions reduce the space needed for installation, helping to save structural costs and optimize the ownership costs while enhancing operational safety and efficiency. Additionally, our modular and prefabricated substation solutions allow faster deployment and scalability of wind projects.

Particularly in the offshore segment, we have OceaniQ™, a qualified portfolio of products, solutions, and services, which is also ready for the floating application, the next frontier. Here, Hitachi Energy's technology is a pioneering technology. I hope that readers already know about the OceaniQ portfolio, and if not, I encourage them to learn more.

Digitalization is another key focus. Our transformers can be equipped with advanced monitoring and predictive maintenance systems that leverage real-time data and analytics. This technology optimizes performance, detects potential issues before failures occur, reduces downtime, extends equipment lifespan, and lowers operational costs for wind farm operators.

By combining leading technology, long experience, and an unmatched installed base, Hitachi Energy is delivering at a speed sufficient to enable the rapid electrification of the energy system. Additionally, we are supporting the scale-up with major investments across the global footprint, as it has been already announced, to expand our capacity for power and distribution transformers factories.

You have talked about portfolio releases, new products, etc., highlighting how your company is contributing now. Also, you emphasized the offshore wind and its challenges. Looking ahead, what do you see as the next big developments in wind power, and how is Hitachi Energy preparing for the future?

The future of wind power will be shaped by several key trends. One of the most relevant developments is the shift towards large

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scale offshore wind projects: offshore wind farms are growing (giga generation, we can say), in capacity, rated voltage, with turbines exceeding 20 MW power, and they require specialized high-voltage transformer solu-

tions to efficiently transmit power over long distances.

To be prepared for this, we are developing the next generation of transformer tech-

nologies that support ultra-high voltage transmission, including advanced HVDC (High Voltage Direct Current) solutions. HVDC is crucial for long-distance power transmission as it minimizes energy losses



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and allows better control of power flows between different grid regions. Our HVDC transformers enable large-scale wind farms to connect seamlessly to national and cross-border grids.

Another important tendency is the growing need for grid-forming technologies. As more renewable energy sources replace traditional synchronous power plants, grid stability will become a critical concern. We

are working on transformers that support power electronics-based solutions, allowing wind farms to provide essential grid services such as voltage regulation and frequency stabilization.

Sustainability is also a major focus for us. Again, we have introduced a dedicated portfolio with transformers embracing several features to enhance sustainability: From the use of biodegradable insulating fluids, through optimized materials to reduce environmental impact to enhanced safety or responsible use of resources. Our goal is to support the energy transition in a



way that aligns with the global sustainability targets, also the sustainability strategy of the companies, while reducing the carbon footprint of power infrastructure.

Together with our customers and partners, Hitachi Energy is committed to scaling up the European energy system to meet the 2030 sustainability targets and beyond.

Which concluding message would you like to share with stakeholders working in renewable energy?

The transition to renewable energy is one of the most important challenges of our time, and it requires a collaborative effort across industries, governments, and technology

providers. At Hitachi Energy, we believe that wind and solar power will play a fundamental role in achieving global decarbonization goals, and we are committed to supporting this process with cutting-edge transformer solutions.

To accelerate the deployment of wind energy, it is crucial to focus not only on increasing generation capacity but also on strengthening grid infrastructure, improving system resilience, and fostering regu-

latory frameworks that enable investment. Our message to stakeholders is clear: let us work together to build a more sustainable and reliable energy system. By leveraging innovative technologies, digitalization, and strategic partnerships, we can overcome existing challenges and drive the renewable energy revolution forward.

It is not only a task, pursuing a sustainable energy future will represent our heritage to the future generations.

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