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GE Renewable Energy, Fraunhofer IGCV, and voxeljet AG plan to develop world's largest sand binder jetting 3D printer for offshore wind turbines

- Project to accelerate and optimize the production of a key casting components[1] of the GE Haliade-X Offshore Turbine
- 3D Printing provides flexibility to produce large turbine components near offshore wind projects, lowering transportation costs and bringing environmental benefits
- Trials of new technology expected to begin in Q1 2022

Friedberg greater Munich, September 14th, 2021 - GE (NYSE: GE), Fraunhofer IGCV and voxeljet AG (NASDAQ: VJET) today announced a research partnership to develop the world's largest 3D printer for offshore wind applications in order to streamline the production of key components of GE's Haliade-X offshore wind turbine. The Advance Casting Cell (ACC) 3D printer under development will benefit from financial support from the German Federal Ministry for Economic Affairs and Energy and will be capable of printing molds to cast components for the nacelle[2] of the GE Haliade-X that can each weigh more than 60 metric tons, reducing the time it takes to produce this pattern and mold from ten weeks or more to just two weeks. In addition, the use of the 3D printer is expected to reduce the product's carbon footprint by eliminating the need to transport the large parts from a central manufacturing location. The partners expect to launch the project during the third quarter of 2021 with initial printer trials starting during the first quarter of 2022.

The project involves the development of a new, large format 3D printer capable of producing sand molds for casting the highly complex metal parts of different shapes and sizes that make up an offshore wind turbine nacelle. The modular 3D printing process, which is based on voxeljet's core "Binder-Jetting" technology, can be configured to print molds for castings up to 9.5 meters in diameter and 60-plus tons in weight, dimensions.

Juan Pablo Cilia, Senior Additive Design Engineer at GE Renewable Energy, said, "The 3D printed molds will bring many benefits including improved casting quality through improved surface finish, part accuracy and consistency. Furthermore, sand binder jet molds or additive molds provide cost savings by reducing machining time and other material costs due to optimized design. This unprecedented production technology will be a game changer for production efficiency allowing localized manufacturing in high cost countries, a key benefit for our customers looking to maximize the local economic development benefits of offshore wind."

The Fraunhofer Institute for Casting, Composite and Processing Technology IGCV is responsible for casting and materials technology issues as well as digital process monitoring. "We are taking a close look at thermal management during casting, and we will evaluate the ideal proportions of the printing materials," said Dr. Daniel Günther, Head of Department Molding Processes and Molding Materials at Fraunhofer IGCV. "Also, we will develop and test new approaches to process monitoring as part of the project." Based on prior experience the team expects to significantly improve the environmental footprint of processes involved in producing the Haliade-X type wind turbines. This sustainability aspect is a firmly established guiding principle of research at Fraunhofer-

Gesellschaft, according to the institute's director, Prof. Dr. Wolfram Volk, who adds: "We aim to optimize the mold printing to avoid extremely costly misprints or even miscasts, to save on binder and activator, and to improve mechanical and thermal behavior during casting. By developing a process that conserves resources as much as possible, we want to help to improve the environmental and cost balance in the manufacture of wind turbines."

Christian Traeger, Director of Marketing and Sales at voxeljet, said, "The test mold we printed for GE in 2019 consisted of dozens of individual parts. With the ACC, we aim to print a significantly reduced number of parts for the full set. Added to that, the mold can be optimized in terms of functionality and material consumption. This optimization makes completely new casting designs possible that can further enhance the efficiency of the turbines."

"While offsite on-demand 3D printing provides many benefits for small quantities of cast parts, running a 3D printing system on-site leverages the technology to its fullest capacity. Given the demand for offshore wind turbines, that will help a lot to fulfill project schedules and high market demands," adds Dr. Ingo Ederer, CEO at voxeljet. "With our productive "Binder-Jetting" technology in combination with our experience in large format industrial 3D printing, we are serving customers in the foundry industry for over 20 years. It is our mission to bring 3D printing into true industrial manufacturing and we are therefore very excited to be part of this groundbreaking project."

The International Energy Agency[3] has projected that global offshore wind capacity will increase 15-fold by 2040, becoming a 1 trillion dollar industry, thanks to falling costs, supportive government policies and technological progress like that behind the Haliade-X offshore turbine from GE Renewable Energy. GE Renewable Energy has been selected to supply its Haliade-X turbine for 5.7 GWs worth of projects in Europe and the US. The company is a member of the Offshore Wind Industry Council (OWIC) and as part of that supports various initiatives that aim at increasing the production of sustainable wind energy.

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Notes

1. Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process.
2. A nacelle is a housing unit on top of the tower of a wind generator that contains its mechanical components.
3. Source: https://www.iea.org/reports/offshore-wind-outlook-2019

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Images

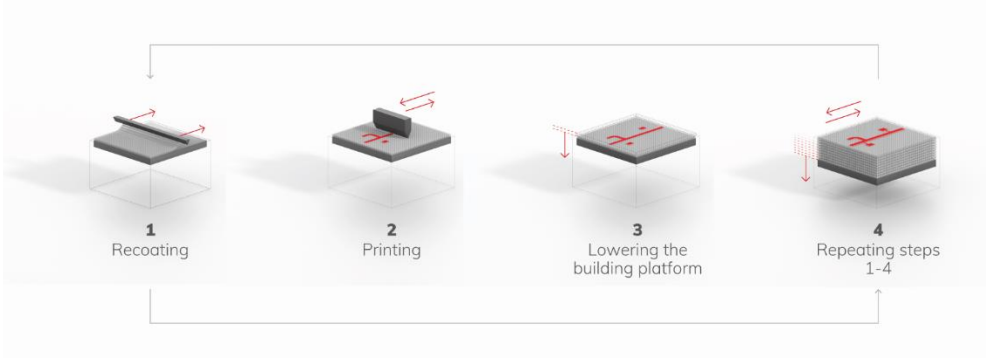
1. 

Figure 1 - The basic binder jetting process is defined by spreading a layer of particle material onto a building platform. Subsequently a print head applies a binder into the powder bed where the part is to be printed. Then, a new layer of material is applied and the process repeats until the final part or mold ist printed. © Voxeljet

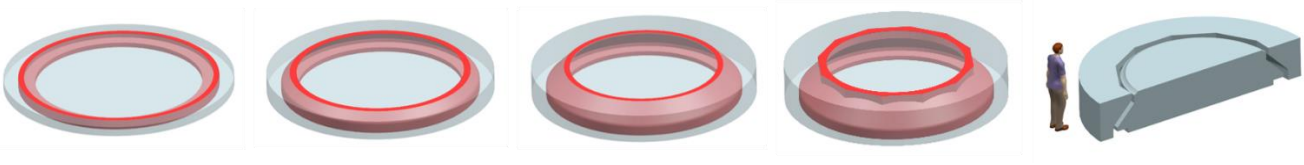
2. 

Figure 2 - The ACC printer will be designed to print molds for key components of wind turbines, with sizes up 9,5 meters in diameter and 30 to 60 tons in weight. © GE Renewable Energy

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About GE Renewable Energy

GE Renewable Energy is a $16 billion business that combines one of the broadest portfolios in the renewable energy industry to provide end-to-end solutions for our customers demanding reliable and affordable green power. Combining onshore and offshore wind, blades, hydro, storage, utility-scale solar, and grid solutions as well as hybrid renewables and digital services offerings, GE Renewable Energy has installed more than 400+ gigawatts of clean renewable energy and equipped more than 90 percent of utilities worldwide with its grid solutions. With nearly 40,000 employees present in more than 80 countries, GE

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About Fraunhofer Institute for Casting, Composite and Processing Technology IGCV
Fraunhofer IGCV stands for application-driven research with focus on efficient engineering, networked production, and smart multi-material solutions. The institute drives innovation on the level of manufacturing processes and material sciences, machines and process chains as well as factory and enterprise networks. One major focus is on the future scenarios and topics of the casting industry. Our core competences in this area include indirect additive manufacturing, molding materials, casting materials, process development, analytics, and simulation.
In an effort to transfer knowledge from research and development into industrial applications, our almost 120 scientists generate individual solutions for the German industry. Our unique selling proposition lies in interdisciplinary solutions in the fields of casting, composite and processing technology. As part of the Fraunhofer Group for Production – an association of production technology institutes – we support our partners with short-term, mid-term, and long-term research projects. Thus, we contribute to ensuring a sustainable competitive edge in Germany and Europe.
Visit our website www.igcv.fraunhofer.de/en, and follow us on social media: Twitter, Instagram, Xing, LinkedIn und YouTube

About voxeljet
voxeljet' s (NASDAQ: VJET) roots reach back to the year 1995 with the first successful dosing of UV-resins. In the context of a "hidden" project, initial 3D-printing tests are performed at the Technical University Munich. Our company was founded on May 5, 1999 as a spin-off from TUM in Munich with a clear vision in mind: to establish a new manufacturing standard by developing new generative processes for the series-production of complex components using 3D printing. In the beginning, operations are launched with four employees at the TUM. Today, we are a globally acting, leading provider of high-speed, large-format 3D printers and on-demand 3D printed parts to industrial and commercial customers. Components manufactured with the help of our technology are flying in space, make mobility more efficient and the production of new engineering solutions possible.
Visit our website www.voxeljet.com, and follow us on Linkedin, or on Twitter.

Cautionary Statement on Forward-Looking Statements
This press release contains forward-looking statements concerning our business, operations and financial performance. Any statements that are not of historical facts may be deemed forward-looking statements. You can identify these forward-looking statements by words such as ''believes,'' ''estimates,'' ''anticipates,'' ''expects,'' ''plans,'' ''intends,'' ''may,'' ''could,'' ''might,'' ''will,'' ''should,'' ''aims,'' "projects" or other similar expressions that convey uncertainty of future events or outcomes. Forward-looking statements include statements regarding our intentions, beliefs, assumptions, projections, outlook, analyses or current expectations concerning, among other things, our results of operations, financial condition, business outlook, the potential timeline for development of and application of new technology and new materials and their impact on future business, the industry in which we operate and the trends that may affect the industry or us. Although we believe that we have a reasonable basis for each forward-looking statement contained in this press release, we caution you that forward-looking statements are not guarantees of future performance. All of our forward-looking statements are subject to known and unknown risks, uncertainties and other factors that are in some cases beyond our control and that may cause our actual results to differ materially from our expectations, including those risks identified under the caption "Risk Factors" in voxeljet's Annual Report on Form 20-F and in other reports voxeljet files with the U.S. Securities and Exchange Commission. Except as required by law, voxeljet undertakes no obligation to publicly update any forward-looking statements for any reason after the date of this press release whether as a result of new information, future events or otherwise.