THE UAS TRIBUNE

Air Taxi To The Wind Farm!

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In a joint project, the energy group EnBW is investigating how off-shore wind farms can be operated with the help of heavy-lift drones.

The rotors of a wind farm are rotating around 100 kilometers from the mainland. Suddenly, an air taxi approaches and drops off three people on a landing pad 100 meters above the water. The engineers cheerfully disembark. They don't have to carry any equipment. A short time before, a heavy-lift drone had already dropped off tools and spare parts on the pad. One hour before the end of the working day, the self-flying taxi picks up the engineers again. They are home in time to eat their evening meal with their families.

What sounds like science fiction could soon become reality. That's be-cause heavy-lift drones have got what it takes to revolutionize the operation of offshore wind farms. They are faster than ships. And they are cheaper to operate than helicopters. Drones are becoming more and more automated, which in turn will have a positive effect on costs. In addition, they fly with hybrid or electric propulsion systems and thus have the potential to play their own part in achieving climate targets.

Yet under what circumstances is the use of drones actually a worthwhile proposition for wind farm operators? The "Upcoming Drones Wind Farm" (UDW) project is setting out to answer this question. Besides the energy group EnBW, the project participants include the German Aerospace Center (DLR), the German Federal Maritime and Hydrographic Agency (BSH) and the wind turbine manufacturer 2-B Energy.

Together they want to determine how offshore wind farms must be equipped in order to fly personnel and materials economically and safely over the sea by drone and what features the drones must possess to enable them to operate in this environment. Where can they land safely? How must the transport containers and cabins be designed? How do the drone and the wind farm communicate with one another? What form should the legal framework take and which authority can approve the flights? Answers to these questions can cer-tainly be found – but only with a great deal of effort.

A Long Range and Heavy Loads

Small drones are already being used in offshore wind farms. They fly around the rotor blades with thermal imaging cameras and provide photos that can identify any material damage. However, the range and load-bearing capacity of small drones are limited. The UDW project, meanwhile, involves drones with a range of about 100 kilometers that can carry loads of up to 200 kilograms. The experts involved in the project are therefore monitoring the development of high-performance drones used for transporting people very carefully. They are on the verge of a breakthrough. The German manufacturer Volocopter, for example, wants to use air taxis at the 2024 Olympic Games in the Paris region to fly passengers across the congested metropolitan area to the competition venues.

The existing technology must be adapted to meet the needs of an off-shore wind industry that will become ever more important. By 2030, wind turbines with an output of 30 gigawatts are expected to be rotating off the German coasts alone. There are plans to more than double this figure to 70 gigawatts by 2045. Offshore wind power will thus play a fundamental role in the supply of energy.

Where Drones Can Cut Costs

This expansion is costing the industry many billions of euros. Operators who want to build an offshore wind farm must participate in an auction. Whoever can operate the wind farm most inexpensively will be awarded the contract in the tendering process. This in turn means that the ongoing operating costs must be kept as low as possible.

After all, the investment has to be worthwhile.

And where can operators achieve the most cost savings? The answer lies in the area of transport and logistics. Special cargo ships are cur-rently used to transport personnel and materials to the wind farms. This takes hours. Upon arrival, the engineers – dressed in heavy safety clothing – cross over to the turbine using a platform ladder. They then have to use a crane positioned at the foot of the foundations to haul the materials up to the wind turbine. An engineer subsequently travels by elevator up to the nacelle and hoists the load to the top using a sec-ond crane. Only then can the actual work begin. This process would be much cheaper and faster if a heavy-lift drone were to drop off personnel and materials directly at the right height.

At present, the engineers remain at sea for two weeks at a time, depending on the distance of the wind farm from the coast. They live on special service vessels anchored close to the wind farms. There are material stores, a canteen, accommodation and social rooms on board. The crews work hard during their weeks spent at sea. The operators are well aware of this and create the best possible conditions, although this is expensive.

For the first time, the UDW project combines the technology of drones with that of wind farms. As such, the partners are bringing very different knowledge to the table.

The DLR is regarded in Europe as one of the leading institutions specializing in unmanned flight. By way of example, from the conception to the actual trial flights, DLR scientists are investigating various unmanned aircraft systems for transporting cargo in the ALAADy (Automated Low Altitude Air Delivery) project. Operational scenarios investigated also include the delivery of humanitarian aid.

EnBW has been gaining experience in the operation of wind farms for more than a decade. The experts at the company know how these projects have to be planned. They are familiar with the obstacles involved in the complex approval procedures and have experience of constructing wind turbines on the high seas.

Obstacle Course

Connecting the world of drones with offshore wind power sounds easier than it actually is. Even on land, planning and monitoring the flight route of a drone are difficult tasks. Completely new conditions come into play where offshore wind farms are concerned. Not just on account of the changeable and rough weather. When the wind changes direction, the rotors are realigned. Accordingly, the drone's planned flight path must be constantly updated. The aim is to manage an ap-proach in the slipstream of the rotor, stopping as few turbines as possible along the drone's path. The powerful rotors also swirl the air in the wind farms. This can also affect the flight of the drones and must be included in the calculations.

The Dutch manufacturer 2-B Energy knows how wind turbines need to be designed if drones are to land on them. The company is contributing its experience in the development of landing pads to the project and specializes in two-bladed rotors, which are viewed as somewhat exotic within the wind power industry, but they may have advantages for the approaching drones.

The German Federal Maritime and Hydrographic Agency (BSH), meanwhile, is looking at regulatory issues surrounding the project. One of the agency's current tasks is to approve new wind farms within Germany's exclusive economic zone (EEZ).

EnBW's Baltic 2 wind farm provides an idea of how complex the legal issues surrounding the use of drones in wind farms can be. Even though it is located within the German EEZ, it directly borders the Danish and Swedish EEZs. If drones were used here, they may have to pass through foreign airspace on approach. Technically, this is not a problem. The legal implications of this, however, must be examined.

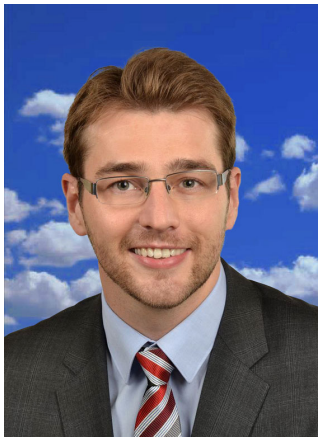
Sharing Is Better Than Buying

Anyone who operates a heavy-lift drone essentially becomes an aviation company on paper. At least that is the case when people are transported. This brings with it a number of obligations. These range from certification and examinations to training for drone pilots. It creates a great deal of work for an energy company that is not familiar with aviation problems.

The aim is therefore for wind farm operators to book logistics services with specialized companies precisely when they are needed – as is already the case with helicopters. By doing so, drones can be utilized more efficiently and operated more cheaply. Different business models are also set to be calculated over the course of the three-year project.

The project extends far beyond the companies directly involved. It is intended to involve the entire drone industry. An Offshore Drone Challenge (ODC) has been organized so that individual manufacturers can show whether they are able to transport heavy loads to offshore wind farms. The tests planned in this context will establish how well the industry can already accomplish such a mission and identify the areas where work still needs to be done.

The project is being funded by the German Federal Ministry for Economic Affairs and Climate Action. At WindEnergy Hamburg 2022, a gathering for players in the wind industry, the participating organizations and companies presented themselves to the public for the first time. The dialogue is set to continue at Amsterdam Drone Week in March 2023. And perhaps it will be clearer in the following year by which time the first heavy-lift drone will land in a wind farm on the high seas.



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