The energy transition's new duck in the pond

by Alexa Ivy

When asked to name a renewable offshore energy source, most people would probably say "wind." That's a perfectly logical answer because, after all, the offshore wind energy industry is well-established. The first farm was up and running back in 1991, and around 20 countries have to date started harvesting power this way. When asked to name a second renewable source, a smaller number of people would say "tidal," referring to the energy gleaned from areas of strong tidal currents. Even fewer people would give "solar" as their answer. This is not surprising because offshore solar power generation as an energy sector is still in its infancy. But that doesn't make it any less important or attractive. It is here – and it's growing fast!

With this in mind, looking to discover more about the challenges and opportunities of developing and deploying offshore solar energy, we take a look at the 2020-founded **SolarDuck**, a Dutch-**Norwegian** cleantech company with big ambitions for the energy transition, putting its Offshore Floating Solar (OFS) systems forward as a realistic alternative to fossil fuels as well as a 'booster extension' to offshore wind energy farms.

SolarDuck's mission focuses on accelerating the energy transition. "Our aim is to develop offshore floating solar energy to a point where, from 2030 onwards, we are deploying in excess of 1.0GW per year," says CEO and Co-founder Koen Burgers. "To achieve this, we are currently involved with numerous international demonstration projects – in **Japan**, **Malaysia**, and the Netherlands."

Solutions to challenges

The design and technology behind OFS systems are based on various factors; sea conditions, environmental impact, reduction of maintenance, safety, and scalability all play a huge role. While it must be noted that SolarDuck is not the only OFS company in the market, its solutions to each of these factors give a broad impression of the challenges and solutions of OFS projects.

To cope with the exposed weather conditions found in offshore waters, SolarDuck has designed its floating systems as triangular or hexagonal platforms topped with solar panels. The geometric shape provides a cost-effective and structurally flexible yet stable construction. For mooring solutions, the innovator looked to the design of floating oil rigs and floating offshore wind turbines for lessons learned.

In terms of the environmental impact of floating solar platforms, it is crucial to reduce this to a minimum. In practice, this equates to minimising the reduction of air and light flow below the solar panels. It is for this reason that SolarDuck's systems are raised to a distance of three to ten meters above the water surface depending on wave height, allowing free flow of air. Open grating around and between panels enables the transmission of sunlight below the platform.

With an eye on reducing lifecycle maintenance costs associated with marine fouling and salt deposition, SolarDuck's floaters have a small surface area to minimise marine growth, and the solar panels have a self-cleaning 10° tilt to prevent the build-up of salt. The entire construction is fabricated from offshore-grade aluminium, which is said to be able to last 30+ years in the corrosive offshore environment.

Safe access (e.g., by maintenance personnel) is provided by offshore-standard grated walkways. What's more, the seakeeping behaviour of the entire structure is such that only low levels of movement and acceleration are experienced by people working 'on board.'

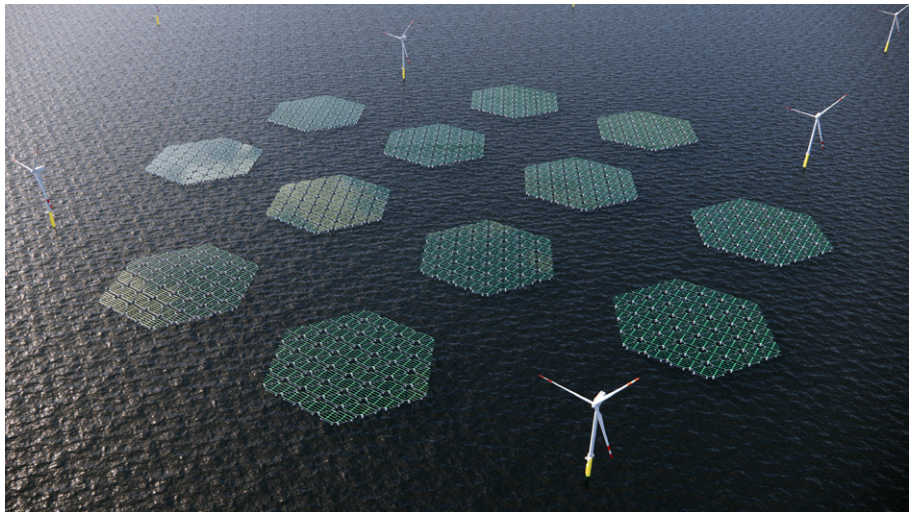
The final aspect to take into account is scalability or, more to the point, cost-effective scalability. To make this form of energy generation as accessible as possible, SolarDuck has set up its company processes and supply chain to make sure that costs are kept to a minimum throughout all stages of production, installation, and operations. This includes solutions such as containerised logistics and commercial off-the-shelf components, straightforward assembly, and installation requiring small & inexpensive workboats.

New (solar-hybrid) lands

As the world faces the numerous challenges of climate change, one of the biggest questions is: when will OFS make its mark? Burgers highlights the scarcity of land as the driving force behind the anticipated growth of OFS. "Of course, onshore solar will remain a vital component of our future energy mix, but the fact is that space on land is getting more and more limited. We are going to have to move solar power offshore to meet our future energy requirements. To this end, perhaps the biggest advantage of offshore floating solar applications is the availability of space, something that is in very short supply throughout the coastal metropolises around the world."

The potential for OFS power generation can be illustrated with two of SolarDuck's current projects: **Merganser** and **Hollandse Kust West** (HKW). The former is an industry collaboration between SolarDuck and several Dutch research institutes. The aim is to develop, test, and validate solar energy platforms that are capable of functioning reliably in the toughest North Sea weather conditions (including hurricane-speed winds and 14-metre-waves). The latter has been, in turn, heralded as the world's largest hybrid offshore floating solar farm.

Both are close to Burgers' heart. "Merganser was one of our first projects,



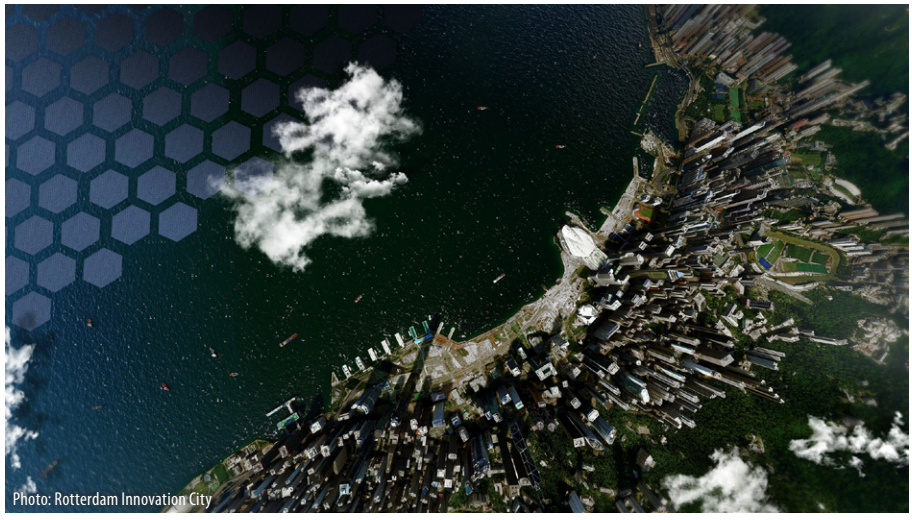


Photo: Rotterdam Innovation City

consisting of six interconnected triangular floating platforms, each measuring 42 meters side-length. The key point is that OFS is an easily scalable technology; Merganser will start its life generating 5.0MW of renewable energy at sea, but we see this idea getting upgraded to gigawatt scale."

"And then we have HKW," he continues, "our flagship project. But more importantly, it's a groundbreaker for the whole OFS industry because it is a hybrid project." What Burgers means by that is that floating solar panels will be installed in between offshore wind turbines. He explains, "Wind turbines are positioned a considerable distance apart from each other. As such, there is a lot of space within an offshore wind farm that we can use to install an offshore floating solar park. Looking at the number of offshore wind turbines currently active in the North Sea, hybrid projects where wind and solar complement each other will really make optimum use of both space and infrastructure. This will yield significant benefits in terms of stability of energy supply."

Koen Burgers; photos: SolarDuck

Hotspots

Another key question to ask is: where will OFS make its mark the most? The answer to this can be found by looking at the Earth's latitude. Just as there are windy areas of latitude (and it's no coincidence that the world's offshore wind energy farms are located in these zones), there are also sunny areas of latitude, forming the so-called 'sunbelt,' which lies in tropical countries with latitudes of within 40° of the equator.

"These are 'hotspots' for solar power energy generation," notes Burgers. "Crucially for OFS, these areas are characterised by their low average wind speeds – this will make installation and operations much less challenging. Furthermore, these 'sunbelt' countries often experience land scarcity. It is for this reason that we see great opportunities in urban conglomerations in Asia: Japan, Singapore, and South Korea, for instance, as well as the island nations of the Caribbean. In fact, we have already signed agreements with partners in Malaysia to undertake a feasibility study and in Japan to build a demonstration project – both signifying 'OFS firsts' for both countries."

Burgers is excited about how SolarDuck is stretching its wings beyond its European roots. More than that, however, he is keen to show the world the benefits of OFS. "Due to rising populations, the need for urban development and agricultural land will only increase in the coming decades. With energy demands increasing, Offshore Floating Solar offers real promise for the decarbonisation of our energy supply." □