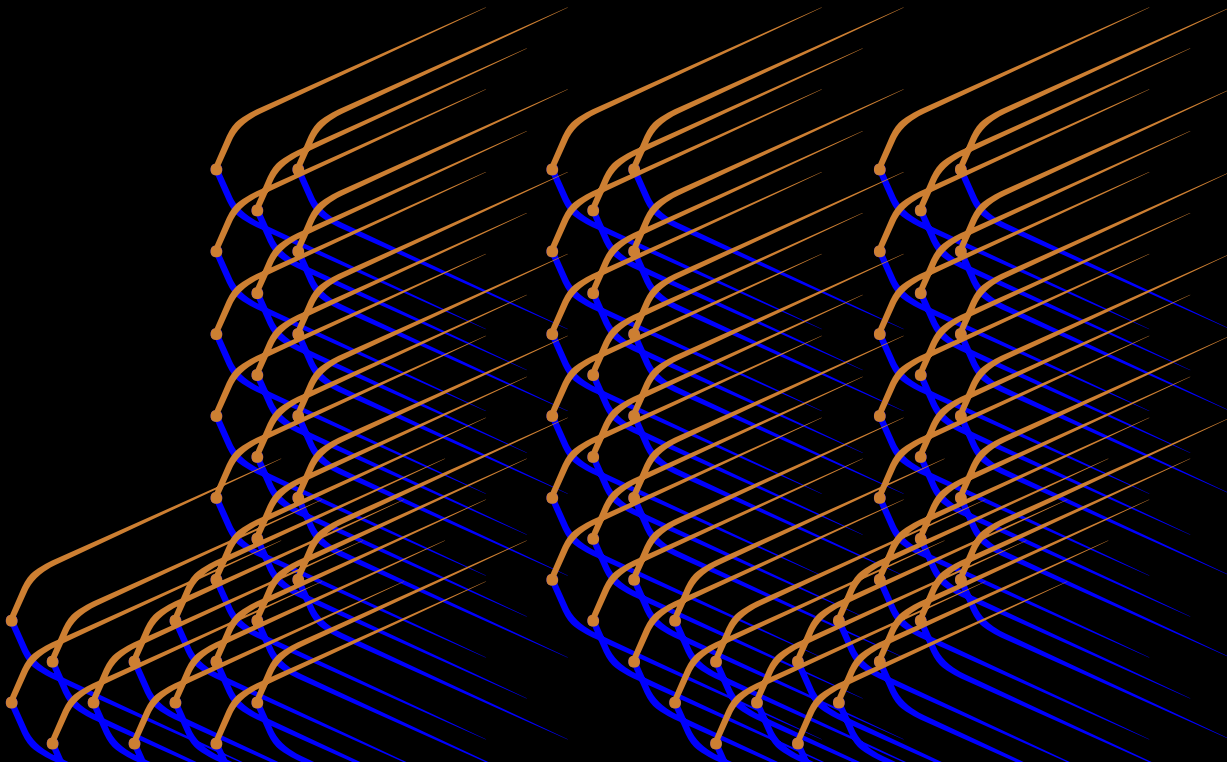


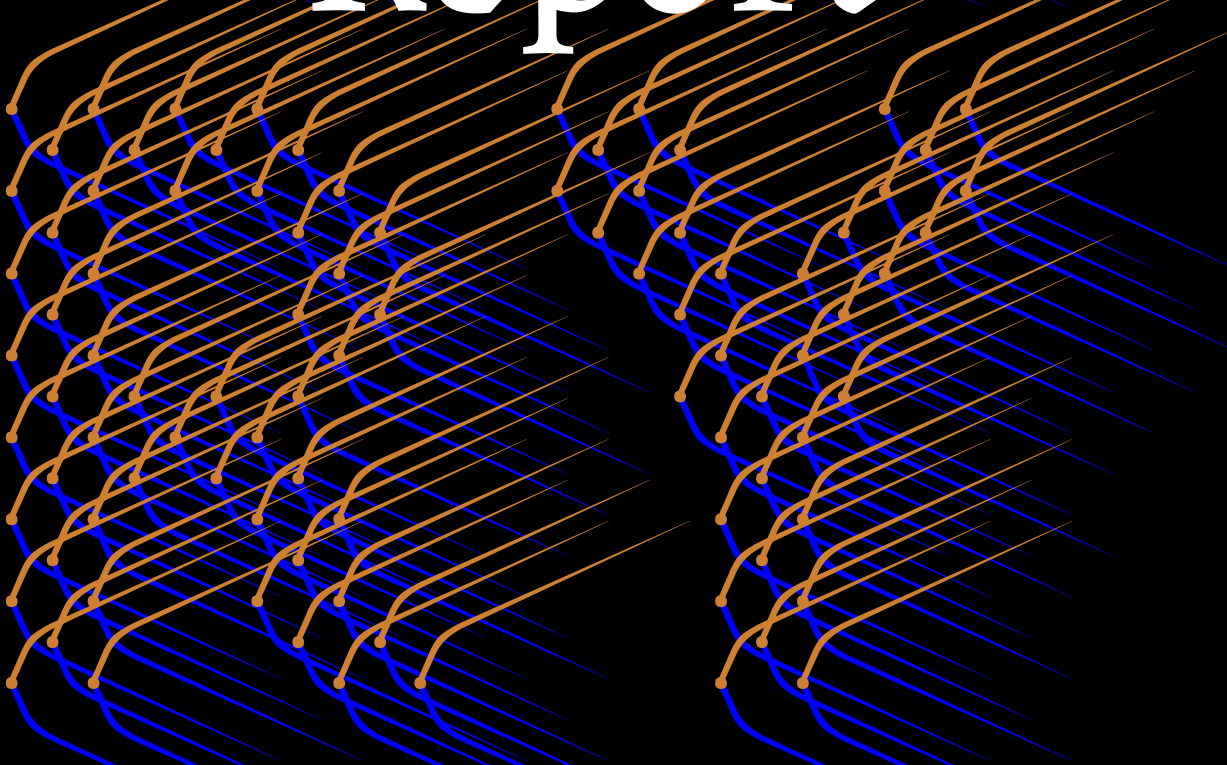
Awards



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Jury Report

**Offshore Wind Innovators
Awards**

2022

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Foreword

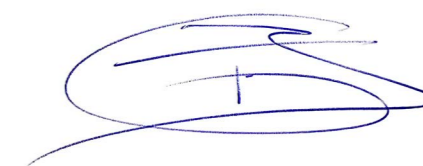
Every year it is surprising to see how broad the entries are for the Offshore Wind Innovators Awards. And every edition it is also gratifying that the number of entries is increasing. These awards, the jury and the audience award, are gaining in prestige. This is the report of the sixth edition of the Offshore Wind Innovators Awards. Together with the growing importance of these awards and above all, the growth of our sector, a reason to also take a step forward with the awards.

This year's entries already contribute nicely to that. From smart algorithms that help to tackle the urgent shortage of personnel to smart energy storage methods. The entire spectrum passes by and at a high level. Fortunately, we were able to put a sharp and very critical jury against that. Suzanne van de Beek (Vattenfall), Jakob Bergvelt (Green Giraffe) and Simon Watson (TU Delft and chair) have judged the entries on their merits with a constructively critical attitude. Not everyone can be nominated just like that. They chose the parties that they believe to be the most promising and relevant to make a substantial contribution to the offshore energy transition.

We are very grateful to the entrants and jury members. Participating and judging are not just

about winning a prestigious prize, but about bringing a clean energy supply closer.

We wish you as a reader a lot of fun and inspiration with this jury report and the profiles of the nominees.



Floris Blonk
Innovation & Community Manager
TKI Wind op Zee
Offshore Wind Innovators

Jury Report

Opportunities and obstacles

In 2050, the Netherlands will only use energy that has been generated without CO2 emissions. Those who work in the offshore renewable energy industry are aware of the opportunities and obstacles we have to overcome to achieve this goal. Offshore wind energy is one of the most promising renewable energy sources to achieve this goal. The cost of wind energy has fallen sharply over the past decade, making offshore wind energy the cheapest source of large-scale renewable energy. With the North Sea on its doorstep, the Netherlands have a favourable location for offshore wind farms. The sea here is relatively shallow in many places, there is a lot of wind to harvest, and the North Sea is bordered with large ports and avid (industrial) buyers of wind energy.

The offshore renewable energy industry has to navigate between the goal for 2050 and the other functions the North Sea is actively used for; for fishing, the extraction of fossil energy, sand extraction, as a military training ground and it is of course our largest nature reserve. The hostile conditions in the North Sea require robust designs and materials. The distance to the coast means long-distance transport of energy, with attendant energy losses.

The maintenance costs are high, not only because of the harsh conditions, but also because qualified personnel are scarce, and the distance to shore requires significant time for access. On top of that, wind is not 100% predictable and it is variable. The supply of wind energy cannot be matched exactly to the demand for energy. As a result, there are shortages of energy at peak demand and energy surpluses that remain unused.

Offshore Wind Innovators Awards

Good ideas to overcome some of the challenges mentioned above can further stimulate the development of offshore wind and other renewable energy sources, in the Netherlands and abroad. The Offshore Wind Innovators Awards from TKI Wind op Zee stimulates new solutions for challenges in the upscaling of offshore wind energy; innovations that help the development of this sustainable energy source and make it easier to install and operate and cheaper.

The awards offer the winner and nominees a springboard to a broader awareness in the sector. This creates opportunities for new partners with whom the idea can be further developed or applied in practice more easily and quickly.

Eight entries

For the Offshore Wind Innovators Awards 2022, TKI Wind op Zee received eight entries - innovative ideas, with a great diversity: Kites to generate energy; Flying boats with drones for cheaper and more sustainable logistics to offshore locations; Smart algorithms to optimize the data management of offshore equipment.

As the jury said about the entries: “Some applications seem rather futuristic or fanciful. Maybe they come just a little too early and need time to mature. Some require further elaboration or justification. But these are all ideas with potential, where we can imagine that over time, they can yield feasible improvements for bottlenecks in offshore wind power expansion.”

The Jury

The jury members are representatives of the offshore wind industry, the financial sector and the research and development sector:



Suzanne van de Beek
Development and Consents Manager Offshore Wind
Vattenfall
Joining Copenhagen
Offshore Partners on 1st Feb



Jakob Bergvelt
Financial expert
Green Giraffe
financial advisors in
renewable energy



Simon Watson
Professor
Wind Energy Systems
Director
TU Delft
Wind Energy Institute
chair of the jury

Assessment framework

Comparing such a varied offer is not easy. The temptations of a playful idea, a creative solution or a slick presentation, delivered with a lot of aplomb, are great.

The fixed assessment framework provides guidance. This consists of five elements:

Motivation

Economic and social impact

Innovativeness

Feasibility and applicability

Entrepreneurship

The concerns of the jury: “In addition, there are other decisive arguments. For example, we think it is important whether an idea offers a solution for the major challenges that offshore wind energy faces. Transport, conversion, and storage of energy is an important issue that needs to be solved in order to make maximum use of renewable energy sources such as wind and sun. Lack of skilled personnel is also a pressing problem at the moment, which can hinder the development of offshore wind energy. In addition, we take into account whether an idea is a game changer or more of an incremental improvement and how robust a solution is. Can you apply it broadly? Can it be scaled up? Is it too early or too speculative?”

Based on the fixed starting points for the jury, three ideas emerged to be the best: FLASC, TechBinder and Elestor. However, there was a clear winner. The three judges all chose these three as their top three, and they were also nominated for the audience award:

FLASC

The large scale and economic storage of electricity from the volatile supply of wind and solar energy is one of the most important challenges to address for these renewable energy sources if they are to be scaled up to the level required. FLASC offers a solution for this with storage capacity based on hydraulics. With the electricity from wind turbines or solar cells, water is compressed into a pressure vessel. When the energy is needed, it is released from the compressed fluid to generate electrical power. The system consists of standard components that are all known and proven in the offshore industry, however, the application is quite novel.

The jury on FLASC: “FLASC scores highly in solving one of the biggest challenges for wind energy: large scale and economic storage. The system seems very suitable for solving imbalances in energy supply in the short term. If this can be scaled up, the economic impact could be immense. Moreover, the solution is environmentally friendly, using only pressure and seawater, without chemical components.”

Score

Motivation	7.0
Economic and social impact	7.0
Innovativeness	6.5
Feasibility and applicability	6.5
Entrepreneurship	6.5

Overall score: 6.7

TechBinder

TechBinder’s augmented reality system improves the relationship between people and machines. Technicians do not transfer their knowledge to one successor, but to a data system that multiple colleagues can consult. In this way, technical knowledge is not lost when people leave. Instead, the knowledge is used more widely, even by people who are still inexperienced. Thanks to the extensive database of visual material, based on expertise from experienced colleagues, the number of maintenance actions and repairs carried out in the field can be efficiently scaled up. And the dependence on scarce experts is reduced. The expert is still there, but onshore, available to be consulted by colleagues offshore.

The jury on TechBinder: “We are surprised that such a system as Smart Field Support from TechBinder is not yet picked up more by the market. It seems so practical.

Such a concrete solution to a major problem: the shortage of human capital. The economic and social impact is great: such a system can ensure that offshore wind energy can be applied on a larger scale. Not because it helps build wind farms, but because it becomes possible to maintain them properly and at a lower cost. This is particularly true as maintenance is still a bottleneck, due to the scarcity of expertise and high costs. The idea may not have a high wow factor, as it’s such a self-evident solution, but it clearly meets a need. And it can revolutionise knowledge management. Even if the staff leaves, the knowledge remains. A big selling point is that Smart Field Support is ready for the market.”

Score

Motivation	7.0
Economic and social impact	6.3
Innovativeness	6.0
Feasibility and applicability	7.3
Entrepreneurship	6.3

Overall score: 6.6

Elestor

Elestor also offers a solution for storing electricity: in a flow battery with hydrogen bromide. With the help of electricity, hydrogen bromide is split into hydrogen and bromine. The battery is then charged. The battery provides energy when the hydrogen and bromine are recombined. Resources are widely available worldwide – they can be extracted from seawater – and the concept is easy to scale up to large storage plant. This makes it a robust and inexpensive way to realise energy storage.

The jury on Elestor: “Elestor convinces with feasibility and entrepreneurship. The organisation is already well-established. Elestor is advanced in the development of the flow battery with bromine and hydrogen and the practical applicability has been proven. This makes Elestor credible when it comes to scaling up the idea to industrial application offshore.

That scalability is a big plus.

With the flow battery, the company offers a practical solution to an acute problem with wind as an energy source: storage to compensate for the imbalance in supply and demand. The materials are in ample supply and can be extracted cleanly from seawater. This is in contrast to the geopolitical and ethical issues surrounding the extraction of scarce raw materials for lithium batteries. A practical plus is also the integration with the hydrogen infrastructure. This is an innovative application of the flow battery, which can help accelerate offshore wind energy production.”

Score

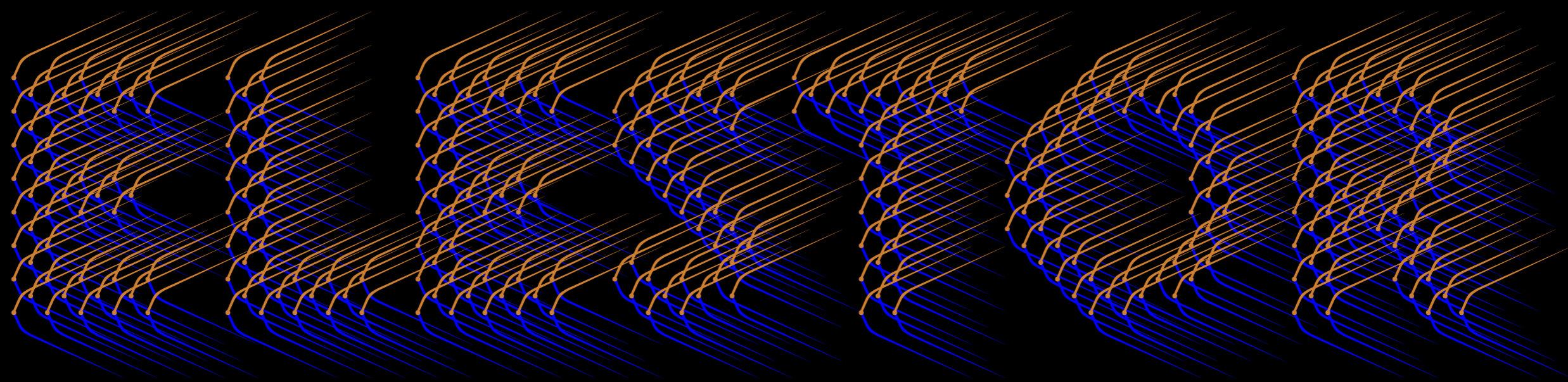
Motivation	7.0
Economic and social impact	6.7
Innovativeness	7.0
Feasibility and applicability	7.8
Entrepreneurship	7.7

Overall score: 7.2

The final scores are in, and the jury is unanimous in their choice:

Elestor wins the Offshore Wind Innovators Jury Award 2022.

They score highest on innovativeness, feasibility and applicability, and on entrepreneurship.





From left to right
Wiebrand Kout
Guido Dalessi
Hylke van Bennekom

Flow battery Elestor offers large-scale storage of electricity

elestor.nl

As low costs for electricity storage as possible. That is what drives Elestor. The company developed a flow battery based on hydrogen bromide. When you think of a battery, don't think of something that fits in your pocket, but think of a large factory, a large-scale, stationary battery that can store the electricity surplus from wind farms and solar farms for a long time. For this idea, Elestor was nominated for the Offshore Wind Innovators Awards. They received the Jury Award and also took home the Audience Award on January the 25th.

The small household lithium batteries have a high energy density but are economically unsuitable for storing large amounts of electricity; a substance such as lithium is far too scarce and too expensive for large-scale application.

Elestor founder Wiebrand Kout foresaw that large-scale storage of electrical energy would be necessary to balance the unpredictable amounts of wind and solar energy with the energy demand. In 2014, he started developing a scalable flow battery that charges with the surplus of wind or solar energy and supplies power when the demand for electricity peaks.

From sea water

The flow battery consists of two parts, separated by a membrane that selectively allows ions to pass through. Elestor batteries are filled

“ We have realized a functioning battery with the size of half a sea container.”

with hydrogen bromide. By adding electricity, the hydrogen bromide is split, and hydrogen ions (protons) are released, which then cross the membrane and form hydrogen. That hydrogen is stored in a separate tank, which is necessary for discharging. When the battery discharges, hydrogen bromide is produced again, and the electricity is released.

“This battery is all about the cost of energy storage. Hydrogen bromide is twenty times cheaper per MWh of storage than, for example, vanadium, which is currently widely used. Why? Bromine and hydrogen are abundantly available and resource extraction is not limited to a few countries. It is simply found in seawater and is a by-product of sea salt extraction,” says Guido Dalessi, CEO of Elestor.

“A positive by-product is that we can integrate the batteries with a hydrogen pipeline. We then use it as a virtual tank: the battery adds hydrogen during charging and extracts the same amount of hydrogen again during discharge. Then we no longer need the hydrogen tanks. That further reduces storage costs.”

Next step

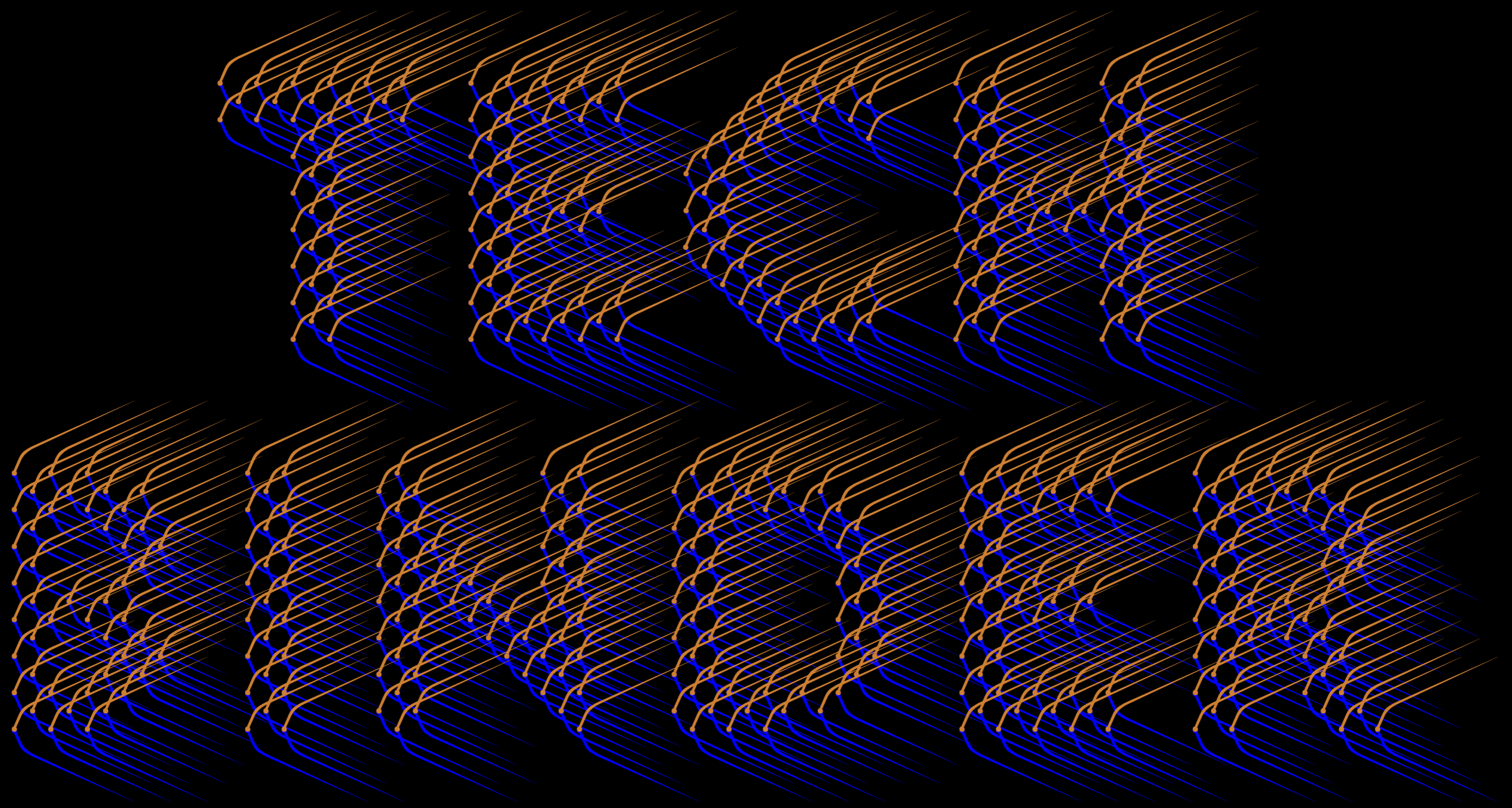
“With the help of various investment rounds, we have realized a functioning battery with the size of half a sea container,” says Dalessi. “We will take the next step in 2023, thanks to a strategic partnership with Vopak, with who we will scale up the technology. The ultimate goal is to build

a 250 MWh battery in Vlissingen in just a few steps. Vopak - now an investor in Elestor - understands the storage of large quantities of chemicals and works worldwide. We can create upscaling with them by equipping the batteries with very large tanks. In this way we can realize large-scale long-term storage of electricity. At the moment we are mainly looking for customers who can help to increase our production capacity, which will eventually make the batteries very cheap. One of our shareholders is the Norwegian energy company Equinor, which operates large wind farms, among other things. Large-scale electricity storage is essential for such projects. In the long term I can also envision a smaller format, at individual windmills, such as at farms, or next to a distribution centre with a roof full of solar cells.”

Meaning

You can no longer call Elestor a startup, with 38 employees of twelve nationalities now and an intended growth to a hundred employees by the end of 2024. Dalessi: “It is quite puzzling in the current labour market, but we notice that we have the wind in our back because we have a making a climate-friendly product and contributing to a cleaner energy supply. We also see people from the fossil sector looking for a job with more meaning. We believe that our batteries will completely replace fossil power stations. Something like that appeals.” ■





TechBinder comes up with a panacea for a secret risk

techbinder.nl

An undiscussed risk in the maritime sector is the massive departure of retired operational experts over the next ten years, while the complexity of the technology is increasing rapidly. TechBinder expects the way of managing data and securing knowledge to change completely as a result and supplies the software for this. “We don’t so much solve technical problems, but business issues. The biggest challenge is to make the relevance penetrate the maritime sector.”

Who is TechBinder?

TechBinder develops software together with partners to improve efficiency in the maritime sector. With their background in maritime technology and process technology, founders Bram van den Boom and Aldwin Schroot see opportunities in crossovers. “What works in the food or pharmaceutical industry also works maritime. After all, a ship is just a floating machine. The process industry is miles ahead of the maritime industry. There is still a lot to be gained on the water, in an accessible way” Bram van den Boom assures. The 2019 startup helps processes on ships, drilling platforms or wind turbines run more efficiently with the help of digital technology. Developed together with partners, students from various universities of applied sciences and since December 2022 with investor Reikon.



On the left
Bram van den Boom
On the right
Aldwin Schroot

“ We extract knowledge from the heads of experienced operators and visualize it. ”

What do you supply the maritime sector?

“It is common practice in industry to collect data about production lines. Which uses the least water, where can efficiency be achieved. Based on that data, you can improve all lines and operational processes.

This is also possible with ships. Many data are already available. About all sorts of things; fuel consumption, sailing routes. By collecting them, maritime operations can be continuously optimized, and ships can sail much more efficient routes, for example.

With Smart Vessel Optimizer we provide a data analysis platform to increase the performance of vessels and equipment. The customer receives more detailed information ashore and can see where profit can be made.”

TechBinder has been nominated for the Offshore Wind Innovators Awards with Smart Field Support. What is that?

“We noticed from the data analyzes that a lot of inefficiency is related to inadequate operation or maintenance. There is not the right knowledge on board to push the right buttons. Smart Field Support is an augmented reality tool for maritime maintenance. We extract knowledge from the heads of experienced operators and visualize it. That can be super practical information: ‘when you hear this rattling, you have to tighten that screw’. But also a detailed manual. Crew members or technicians with less experience can get precise

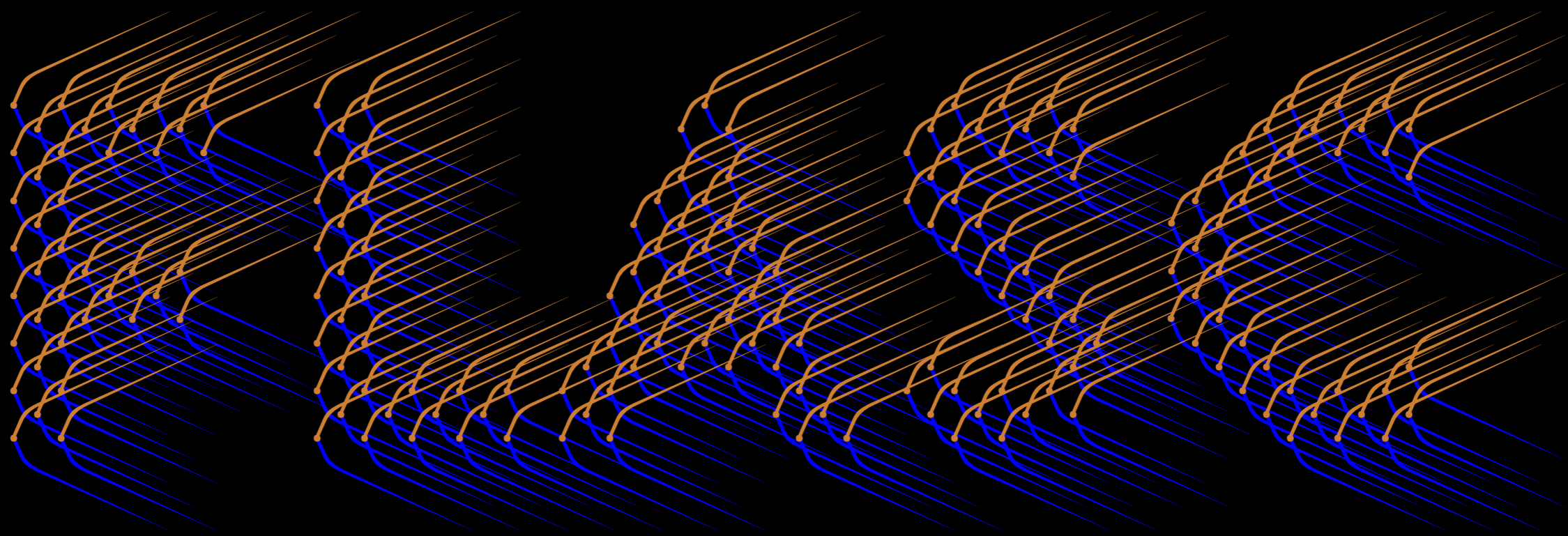
information about the equipment on site by scanning it with their phone or tablet. This way we can also safeguard experience and prevent it from being lost over time. In addition to the new knowledge that data analysis generates. We built up our customer base in corona time, I’m pretty proud of that. About fifteen customers now use Smart Field Support, from Van Oord and Rijkswaterstaat for maintenance of the Afsluitdijk, to Reikon and Aegir.”

What sets you apart?

“Our software fully complies with the industry standard, but the combination of data collection and an augmented reality tool is unique. Something simple: if a machine needs a new filter after 10.000 operating hours, you will receive a signal after 9.500 hours thanks to the data platform. At the same time, you can see step by step what is needed to replace that filter: put on protective clothing, switch off the power, open a specific cover, et cetera. In addition, the technician who is on site can consult an expert remotely.”

“Working this way prevents anyone from getting on a plane for a minor reset. Or that you have to find out on the spot that the right parts have not arrived. Customers indicate that the number of repairs that go right the first time has increased by 30 percent. And that they have earned back the investment in our product in one to six months,” says Bram van den Boom. ■





FLASC: Hydraulic solution for offshore energy storage

offshoreenergystorage.com

With seawater and compressed air, FLASC offers a solution to one of the biggest challenges of wind and solar energy: balancing energy supply and demand. The simplicity combined with the impact of the idea earned FLASC a nomination for the Offshore Wind Innovators Awards 2022.

FLASC works simply: with the surplus electricity from wind turbines or solar cells, a hydraulic system compresses air by pumping seawater into a pressure chamber. The energy is released when the air expands, and the seawater produces electricity on its way out. “No scarce or risky chemicals, but techniques and materials that have long proven themselves at sea. But then in an innovative application, which also produces a high energy density in shallow water, where the water pressure is low. Such as the Dutch parts of the North Sea, where there are many wind farms,” says Daniel Buhagiar, one of the founders of FLASC. “This technique works particularly well under water because the sea ensures natural cooling of the compressed air. As a result, we avoid the energy loss that occurs on land because increasing pressure is accompanied by heating.”

In the foot of a wind turbine at sea, on the bottom under a floating wind farm; FLASC stores the energy right where it is produced.



From left to right
Daniel Baldacchino
Daniel Buhagiar
Adrian Singuran

**“ Since testing
a prototype
developers
of wind farms
have shown
interest.”**

Island of Malta as cradle

The idea arose in 2014 in Malta, Buhagiar’s homeland. Buhagiar: “On a small island like Malta, land is scarce, but sea is plentiful. Looking at maritime solutions for contemporary issues is therefore obvious. I obtained my PhD from the University of Malta on offshore wind energy transmission. My research started from an academic question: how do you get the periodic energy from wind turbines evenly into the electricity grid? The advantage of such a scientific start is that you can first build up knowledge in peace and can simulate and test. This leads to robust technology that was already extensively tested before we looked at commercialization. That is important: the maritime sector does not like risks. Testing a modest prototype in practice, in the port of Malta, was the game changer. That’s how we knew it worked. Since then, developers of wind farms in particular have shown interest. We see them as our primary market.”

Pilots

“There is an innovative climate for wind energy in the Netherlands. There was already a link with the Netherlands: Tonio Sant, my PhD professor and now also FLASC CTO and co-founder, had obtained his PhD in Delft. This Dutch connection is one of the reasons why we founded FLASC in Delft at the end of 2019. We are now working on the technology

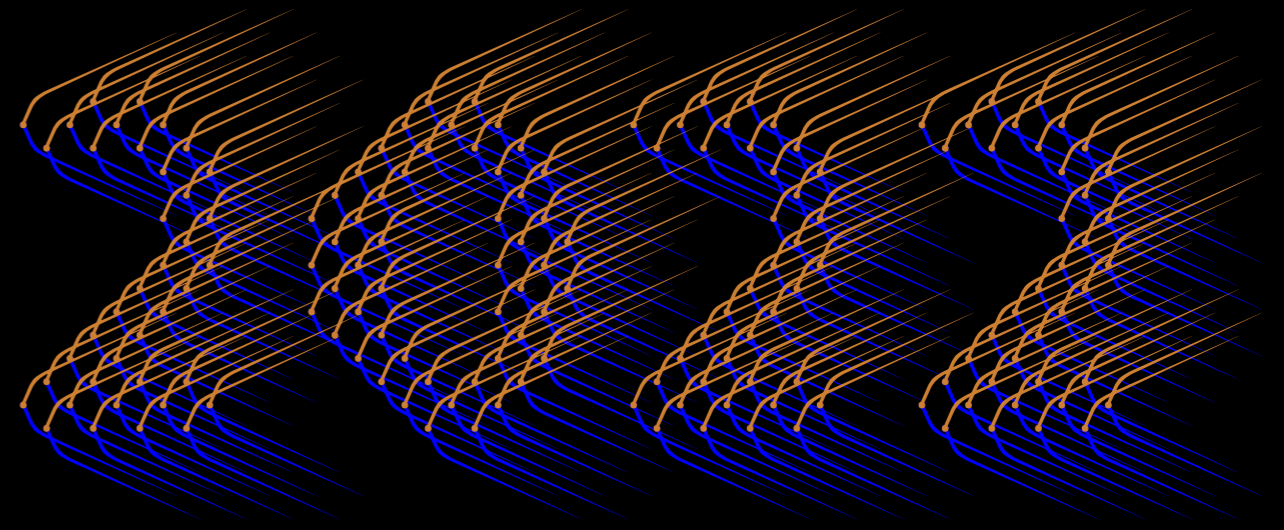
with a team of ten people, partly at the University of Malta, partly at FLASC in the Netherlands. Thanks to our strategic position in the Netherlands and being part of the Buccaneer Accelerator, our commercial network has expanded considerably.” FLASC is currently expanding its experience with more pilots, including one for the UK market with partner Subsea7. At the same time, important equipment will be commissioned this year at the University of Malta for deployment in Greece as part of a major European project. The FLASC energy storage technology is built into the platform of a floating wind turbine.

Find investors

The next step is certification of the system, expanding the team and building on a larger scale. “We need money and a commercial partner for that. Finding a platform for this is the most important task in the coming year. Nominations such as those for the Offshore Wind Innovations Awards help with that. This way we can show our potential broadly, specifically aimed at innovation projects in Dutch offshore wind farms, such as the upcoming tender for IJmuiden Ver,” says Buhagiar. “The ultimate goal is to realize our vision of accelerating the energy transition by developing and bringing to market technology that allows us to maximize the efficiency of large-scale clean energy sources.” ■



Entries



Elestor BV
elestor.nl
Arnhem

Kitepower
thekitepower.com
Delft

Sideshore Technology
sideshore-technology.com
Den Haag

TechBinder
techbinder.nl
Rotterdam

FLASC B.V.
offshoreenergystorage.com
Malta / Delft

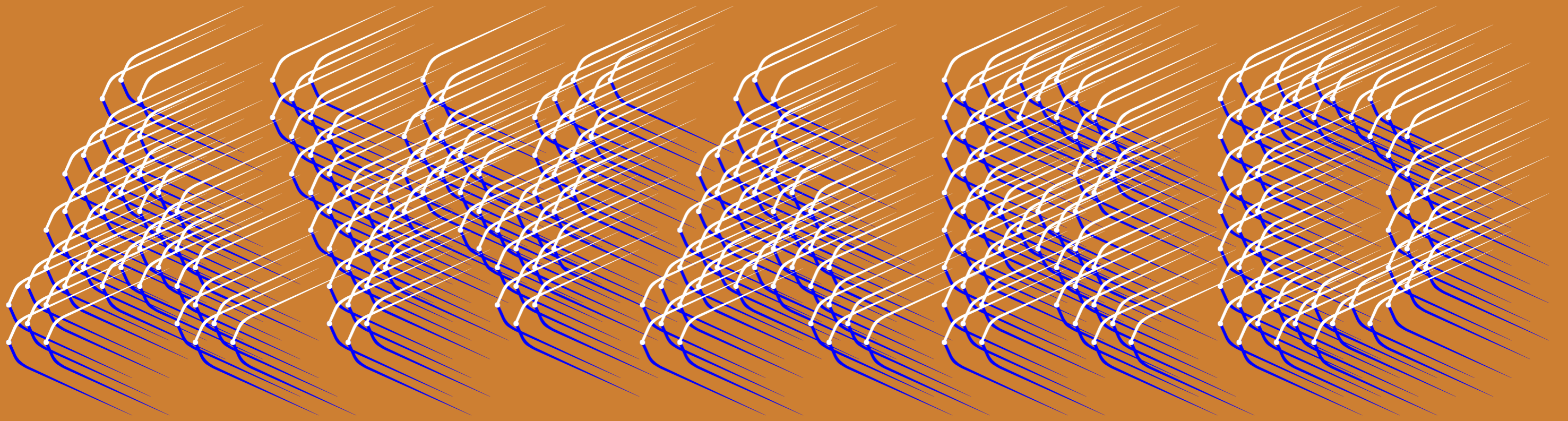
Maridea
maridea.nl
Delft

Speeder Systems
speedersystems.com
Aalsmeer

Twindo
twindo.ai
Koog aan de Zaan

Winner

Jury & Audience



Elestor

Colophon

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**Portraits nominees
Nicoline Rodenburg
& Portraits provided
by jury members**

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Offshore Wind Innovators is TKI Wind op Zee's network for innovative organizations in renewable offshore energy. Every year, TKI Wind op Zee presents the Offshore Wind Innovators Awards under the name Offshore Wind Innovators to promote important innovative contributions to the offshore energy transition. An award is presented by a jury and the public can vote for the other award.

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