Energy Observer



Press file



Main partners





















Institutionnal partner





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Presentation

The Energy Observer project was born in 2013 from the commitment of Victorien Erussard, a master mariner, who teamed up with explorer, Jérôme Delafosse. Aware that it is now vital to commit to the planet, they gathered around them a complementary team of sailors, scientists, engineers and reporters to create the first selfsufficient vessel capable of drawing its energy from nature whilst also preserving it.

The dream became a reality 4 years later, when the Energy Observer vessel was launched for the first time. Developed from a legendary multiple award-winning catamaran, Energy Observer is a laboratory for ecological transition designed to push back the limits of zeroemission technologies. Hydrogen, solar, wind and water power, all the solutions are experimented with, tested and optimised here with a view to making clean energies a practical reality that is accessible to all.

Criss-crossing the oceans in a bid to get out and meet those who are coming up with sustainable solutions for the planet every day, Energy Observer has become a movement, a round the world Odyssey, where every stopover is an opportunity to learn, to understand and to share the different energies.

The Caribbean Se

May 12, 2020

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A passionate team

Sailors, engineers, reporters, there are around fifty of us passionate protagonists involved in the Energy Observer project. A variety of professional backgrounds have formed a unique, united team with strong convictions and objectives to push back the boundaries and speed up energy transition. Doers rather than theoreticians, Energy Observer's teams devise, gather, construct and film reliable and realistic solutions. While some of us come from offshore racing, with a passion for performance, mechanics or structures, others have backgrounds in the merchant navy, with a culture of rigour and punctuality. These universes are constantly being challenged by engineers and researchers from the top laboratories. This alchemy of perfectly complementary skill sets adds performance, resourcefulness, innovation as well as reliability and accessibility to the systems developed by Energy Observer. It also inspires curiosity with regards to fellow pioneers and their solutions.



The Energy Observer team in Svalbard © Energy Observer Productions - Antoine Drancey

Spitzberg

Februar 12, 2020

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Project instigators



Victorien Erussard Chairman, founder and captain

A versatile officer in the merchant navy, he has been sailing on several vessels as far as Antarctica. However, this professional sailor has also graced a series of race podiums over the past 10 years, from the Route du Rhum, to the Transat Jacques Vabre to the Quebec-St Malo. During one of these transatlantic passages, a broken diesel generator in the middle of the Atlantic made it impossible for him to helm his machine albeit surrounded by solar, wind power and hydropower and Victorien realised that the finest victories are those that have some meaning. At that point, he decided to invest his time in the race for smart energy rather than the race for trophies.



Jérôme Delafosse Expedition leader

A professional deep-sea diver with over 20,000 hours' under water, participation in the Cleopatra's Palace excavation, 800 dives with sharks which he proudly champions, Jérôme has been exploring the oceans for quarter of a century. Presenter of Nouveaux Explorateurs (New Explorers) on Canal +, he has also toured the world making numerous films, shows and documentaries. Malouin of origin as Victorian, he directs the films of Energy Observer.

\rightarrow The patrons



«Energy Observer, the first hydrogen-powered vessel to navigate its way around the globe, is more than a boat. She's a demonstrator and detector of solutions. She is shaping a future that is already upon us. It's a long-term evolutionary project, which is creating a wave of positive energy and is a unique showcase for innovations regarding ecological and energy transition.»

Nicolas Hulot - Founder of the Fondation pour la Nature et l'Homme



« Today, the world of energy is undergoing a genuine revolution by integrating more and more renewable energies using different mediums: electricity, hydrogen and heat. Connecting these is a real challenge, which is even more ambitious on something the size of a boat. Energy Observer is an early indication of how tomorrow's energy networks will be on land. »

Florence Lambert - Director of the CEA-Liten

An Odyssey around the world of positive and sustainable initiatives for the planet

A 3-year navigation: from 33° to 78° north, from africa to the arctic

Since Energy Observer's launch in 2017, a lot of water has flowed beneath the decks and hulls of this historic ship. Water of all temperatures, from the Mediterranean Sea to the icy Arctic Ocean, via the Baltic Sea.

And what might have seemed impossible a few years ago has become a reality, punctuated by world debuts: from the first complete on-board hydrogen system (from the drop of seawater to the watt to the propeller) in 2017, through to the first passage up to Svalbard without using fossil fuel in 2019.

This first phase of the 3-year odyssey in Europe enabled our on-board technologies to be validated so we could go on to deploy them on a large scale.



© Energy Observer Productions - Amélie Conty

We have already covered over 18,000 nautical miles, or around 33,000km and made 48 stopovers in 25 countries using renewable energies. Today, it is possible, even in extreme conditions like those we encountered in Spitsbergen, the epicentre of climate change, to navigate the waters entirely self-sufficiently, drawing energy from nature with no ecological impact. Today, it is possible to get around in a different manner. This is what the vessel has demonstrated in her passages along the French coast, the whole of the Mediterranean basin and this year in northern Europe and as far as the Arctic, which marked the climax in this human and technological adventure.

A floating laboratory for renewable energies and hydrogen

A once legendary race boat, since refurbished, Energy Observer is a genuine experimental platform for future energies. Combining three sources of renewable energy (solar energy, wind power and hydropower) and two forms of storage (batteries and hydrogen), it is the symbol of an energy revolution that is already up and running and suited to all regions and all latitudes.

For the vessel and her crew, the mission is to test these cutting-edge technologies in an extreme environment and to enable practical feedback on this smart energy system. That's why, after each on-the-water campaign, the vessel heads back to the yard to have her high-tech system optimised and developed.



© Energy Observer Productions - Antoine Drancey

Svalbard is a genuine barometer for the global climate. Indeed, an impressive variation in temperatures has been observed here in the past decade or so, together with an over-reaction to all climatic factors. Its temperature is increasing 2 to 3 times faster than elsewhere on the planet.

Navigating as far as Spitsbergen from Russia entirely self-sufficiently demonstrated that our energy mix works in extreme conditions and is therefore the future of maritime transport, as well as prefiguring the latest energy network development on shore. Furthermore, in a region that is so remote and yet profoundly influenced by climate change, it served as a powerful symbol and an illustration of our capacity to take action.

« We do not have an unlimited number of resources. We cannot continue to consume excessive amounts of fossil fuels, which have been amassed for millions of years and whose combustion is harmful to our health and that of the planet. On the contrary, we must cooperate with nature intelligently as we do with our boat: we produce what we consume, our pace is dictated by the speed that renewable energies enable us to reach! What we particularly want to accelerate is energy and ecological transition thanks to the rolling out of renewable energies and green hydrogen, which are key elements in combatting climate change ».

Victorien Erussard, Chairman and captain

In 2019, Energy Observer therefore continued its dual mission as a clean tech laboratory whilst bearing witness to the climate emergency. As such, the trip to Spitsbergen was much more than a technological first. Indeed, it was also the culmination of three years of experimental passages across the seas of Europe.

An ambassador for the hydrogen revolution

Hydrogen is the most abundant chemical element in the Universe. Inexhaustible, it is exceptionally rich in energy: it releases up to 4 times more energy than coal, 3 times more than diesel and 2.5 times more than natural gas. Its combustion emits no greenhouse gases or fine particle emissions. Therefore its potential is immense and, in terms of energy transition, it opens up a vast field of possibilities by offering the perfect storage solution for renewable energies. As it is essentially a combination of other elements, it's important to learn to extract it at a low cost and in a decarbonised manner, namely without using fossil fuels. In this way, Energy Observer is the first vessel in the world capable of producing hydrogen aboard from seawater through electrolysis of the water. Circumnavigating the globe independently using this unique energy system, Energy Observer is demonstrating the performance of hydrogen to decision-makers, companies and citizens so as to favour its large-scale roll-out in the coming decades.

A mission to promote local initiatives and sustainable solutions for the planet

Since the genesis of the project in 2013, our vision has been twofold. We wanted to test clean technologies aboard this boat, as well as meet with the pioneers of sustainable development.

Therefore, this "Odyssey for the future®" represents the innovative solutions for the environment, which the team is discovering throughout this circumnavigation of the globe via 50 countries and 101 stopovers.

The first French ambassador for the Sustainable Development Goals

With Energy Observer, Victorien Erussard, founder and captain of Energy Observer, has been appointed by the Ministry of Ecological and Inclusive Transition, the primary French ambassador for the 17 sustainable development goals adopted by the UN in 2015, to convey France's message about the need to preserve the planet and inspire the greatest number of protagonists...

All over the world, women and men are devoting their energy to the creation of sustainable solutions for a more harmonious world. Energy Observer is navigating its way along to meet them, in order to detect and promote their local initiatives and their actions in terms of the circular economy, responsible consumption, actions in favour of gender equality, reasoned and responsible agriculture, protection of life on earth and aquatic life, etc.This role of ambassador is translated through our stopovers, our documentaries and the "Energy Observer Solutions" digital platform, which enables us to get to the



© Energy Observer Productions - Amélie Conty

real heart of the matter in terms of solutions and promote these 17 sustainable development goals and their interrelationship. In this way, we are constructing a database of "Solutions" akin to Ariadne's thread in our round the world odyssey. It is proving to be a positive and inspiring thread, as evidenced by the fact that thousands of protagonists are already working to change the world.

Energy Observer Solutions

Energy Observer Solutions is a digital platform launched last June, though production began from the very start of the project in 2013. It highlights solutions regarding ecological and inclusive transition identified by Energy Observer's editorial and scientific community all over the world and directed by the pioneers who are reinventing tomorrow's world. All these Solutions are being grouped together for the first time on the Energy Observer Solutions platform and illustrated through a web series spanning 1,000 short episodes produced over a 6-year period, through the prism of sustainable development goals, in connection with the Ministry of Ecological and Inclusive Transition, the United Nations Sustainable Development Solutions Network (SDSN) created in 2012 under the auspices of the UN Secretary-General, the International Association of Universities (IAU), Ademe and UNESCO. These inspirational and positive 2 to 3-minute videos, whose tone and format is geared around the social networks, are designed to raise awareness beyond the borders about these forces for change by giving visibility to their solutions and their local projects.

www.energy-observer.media/solutions



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The production of documentary films

Energy Observer is producing a premium documentary series broadcast over the Canal + group's channel, "Energy Observer, l'Odyssée pour le futur" (Energy Observer, Odyssey for the future®) with 8 episodes already made and dozens to come. From Saint Malo to Saint Petersburg, this collection of films traces the lives of the crew aboard Energy Observer and their encounters around the world.

A 90-minute video was also broadcast in prime time during the COP 25. This CANAL+ documentary creation was produced by Energy Observer Productions and Upside Télévision and directed by Jérôme Delafosse. Entitled "Energy Observer, les messagers de la Terre" (Energy Observer, the Earth's messengers), it traces both the human adventure and the technological challenges taken on by Energy Observer during her passage from Saint Petersburg to Spitsbergen whilst self-sufficient in energy, and during encounters with committed communities in Europe, Asia, South America and Africa to protect our children's future..

Live on-board content

Energy Observer also shares live content: log books about the highlights of the Odyssey (life aboard, deciphering of the ecosystems by a scientist or biologist, the making of the film, the boat's technical operation, perspectives on the major world days...), a way of immersing oneself in the daily life of the crew.

This educational content, accessible to all, enables a greater understanding of the key challenges of renewable energies and ecological transition.

« Through this unique Odyssey, we want inspire people so as to raise awareness more widely, to prove that man can live in harmony with nature and that ecological transition is paving the way forward to a new paradigm shift. »

Jérôme Delafosse, Expedition leader and film director



© Energy Observer Productions - Antoine Drancey

A travelling exhibition village

Throughout the Odyssey, a travelling village is deployed at the key stopovers, which opens to the public free of charge in what is a truly unique experience.

Thanks to an interactive and educational exhibition, with virtual reality and 360° screenings, it is a genuine window on the world today and tomorrow. It is a venue for encounters, exchanges and discoveries on the subject of energy and ecological transition and has played host to nearly 300,000 visitors over the past 3 years.



© Kadeg Boucher

In 2020, the exhibition village will be reconfigured using the containers provided by our new strategic partner CMA CGM, a leader in the transport and transformation of these modules, which have now become the reference in international trade.

These containers will be transformed into a dynamic circular economy thanks to the expertise of CMA CGM's teams.

They will not only be used to display the educational content of Energy Observer, but also to transport all the geodesic domes and all the exhibition's equipment. The objective is to reduce the carbon footprint of the transport of each container on CMA CGM's lines to the lowest possible level.

Between 2005 and 2015, the Group reduced its C02 emissions per container transported by 50% and has set a target of a further 30% reduction between 2015 and 2025. For this village, an autonomous renewable energy system is being developed, based on the same principle as the vessel but with proven, robust and versatile components to operate in all weather conditions (high heat, humidity, very frequent handling).

New milestones for the round the world

After her fourth optimisation refit and relaunch in Saint Malo on January 21, Energy Observer will leave her home port of registry from February 17.

In so doing, she will embark on the latest phase in her 100% renewable energy Odyssey, which will involve travelling the world for 4 years, targeting spectacular innovations and sites that are increasingly remote and therefore exposed to the consequences of a dependence on energy and global warming.

This latest navigation will also be longer and more intense, with three oceanic crossings already lined up for 2020. In fact, in the space of just one year, the boat will cover the equivalent of what she's navigated in the past 3 years! Once and for all, the project heralds a technological turning point and a full-scale test of the now validated energy systems, which now thoroughly deserve the incomparable test bench of the open ocean.

2020 : bound for Tokyo and the Hydrogen Olympics!

2020 will be the opportunity for fresh encounters and some fantastic stopovers: Morocco, Cape Verde, the West Indies, Hawaii and finally Tokyo, from July 21 to August 16, during the Olympic Games.

A powerful and meaningful stopover for Energy Observer.

Indeed, these Olympic Games, where the dominant theme is innovation, will also be an opportunity for Japan to promote a hydrogen-powered society and demonstrate its expertise in this regard. Since the Fukushima catastrophe in March 2011, the country has made this form of energy a priority in terms of its mobility and future city, as evidenced by its spectacular initiatives in this direction. Firstly, considerable investment has gone into developing transport and infrastructure based on the use of hydrogen. In this way, the government has set itself a target of having 40,000 vehicles running on fuel cells in circulation in the country this year and no fewer than 800,000 by 2030.

This is all the more impressive given that, coupled with an inverter, the hydrogenpowered vehicles can be used to power a household for several days. An appealing asset in a country that is especially fearful of earthquakes and other natural catastrophes. Outside crisis considerations, over 250,000 Japanese households have already been equipped with a fuel cell for their energy supply.

In more practical terms, several hydrogen production facilities have already been installed. Furthermore, Air Liquide has announced that it wants to open forty-or-so new stations by next summer. Ultimately, these are intended to power six thousand apartments built for the Olympic village, as well as a whole fleet of hydrogenpowered vehicles: some 500 Toyota Mirai cars as well as around a hundred Toyota Sora buses will be deployed during these Olympic Games.

Like its Korean and Chinese neighbours, Japan has clearly taken things to a whole new level in the hydrogen revolution, and Energy Observer is keen to bear witness to this clean and respectful, decentralised, self-sufficient in energy and digitalised society, to which future generations aspire.

Naturally, it is also keen to discover the numerous innovative solutions to be shared again and again in its audiovisual productions, in this country where technology is very much part of everyday life like nowhere else.

→ Covid-19 News

The vessel'a schedule is obviously impacted by international health news. The Japanese Prime Minister and the International Olympic Committee have officially announced the postponement of the opening of the Olympic Games in Tokyo until 23rd July 2021. Energy Observer's route will therefore evolve to include our ship and its travelling exhibition village.

This year, the route could be refocused around the Caribbean Sea for filming on the issues of biodiversity protection, then in California with stopovers in San Francisco and Los Angeles, cities particularly active in innovation and energy transition.

2020: California, spearhead of the North American ecological revolution

Following this 3-week stopover, another Pacific crossing will beckon, this one to California with three key stopovers, in San Francisco, from October 2 to 18, Los Angeles, from November 13 to 22, and San Diego from December 4 to 20.

Here too, this region, considered for a long time to be the final frontier, is today demonstrating a remarkable pioneering spirit in terms of energy and ecological transition, in a country largely fuelled by hydrocarbons.

With its megacities, its oil-producing tradition and its water stress, the State of California is particularly exposed to climate change, large fires and the saturation of air particles. This is why it has changed course and is now investing heavily in sustainable solutions with such bodies as the CCI (California Climate Investments), setting the most drastic standards in terms of emissions, as issued by the CARB (California Air Resources Board), to become an international reference. Hydrogen is used widely here along the entire Californian coast, with the highest concentration in the world of cars running on hydrogen (More than 7,000 in 2019) and a target of 5-million zeroemission vehicles in 2030, compared with 350,000 today.

Los Angeles has witnessed the design of the first hydrogen-powered lorries, a fuel

that's now a regular at normal service stations, and above all it boasts a new generation of entrepreneurs, designers and pioneers inventing tomorrow's world. The largest solar park in the country, Solar Star, features over 1.7-million photovoltaic panels and the State of California has committed to the "100% Clean Economy Act", which plans to switch from 30% to 100% renewable energies by 2045.

In San Francisco, it is the digital economy and the sharing of mobilities and technological innovation that will accommodate Energy Observer at the heart of its bay. Under the Golden Gate Bridge, the first hydrogen-powered aluminium ferry, Water-Go-Round, is being built using what are robust technologies, akin to those used on Energy Observer. Furthermore, a great many protagonists involved in the clean, decentralised and digitalised energy revolution are in Silicon Valley.

San Diego, which will see America's first hydrogen-powered train hit the track in 2024, is just as important a stopover for Energy Observer due to its strong maritime culture born from the presence of an massive Marine base, together with the memory of the America's Cup events and the most radical of Larry Ellison's multihulls, Oracle, whose architect works with Energy Observer...

\rightarrow News

Following the international health news, the Energy Observer's route will evolve so that our ship and its travelling exhibition will be present in Tokyo during the Olympic Games in July 2021. Thus, the fifth year of navigation will concentrate on the following destinations: Pacific, Tokyo, Korea and China.

2021-2023: Targeting biodiversity and the southern hemisphere

In 2021, after the golden triangle of biodiversity (Galapagos, Cocos and Guadalupe Island), the expedition will cross the South Pacific (Polynesia, Fiji, New Caledonia) bound for Australia. Amidst countless remote sites, all in urgent need of self-sufficiency in energy and more under threat from climate change than our old Europe, Energy Observer's mission will still be to shine a spotlight on the climate heroes, as well as to offer them reliable and affordable solutions henceforth.

In 2022, Indonesia, Hong Kong, Singapore, India and South Africa will present their tiger economy challenges with unashamed growth but dramatic climatic fragility. More intense than in Europe, the climatic pressure on Asian cities is becoming unbearable, as is their atmospheric pollution and their dependence on energy. More so than elsewhere, Energy Observer will be able to witness the fundamental interrelationship between the 17 Sustainable Development Goals. How can one preserve the biodiversity and the quality of Asian waters without guaranteeing everyone access to clean energy?

In 2023, the expedition will take in Brazil, the Caribbean and the America's East Coast, setting sail from New York, for the seventy-eighth session of the United Nations. Finally, 2024 will be marked by a commitment from all the Energy Observer teams within the scope of the organisation of the Olympic Games where it will have as great a presence in Paris as in Marseille.



Innovations to accelerate the energy transition

Assesment 2019: a mature technology and a new world first

Since 2017, over 18,000 nautical miles or more than 30,000km, have been covered by the laboratory boat using renewable energies.

In 2019, the boat covered 8,056.51 miles in northern Europe, from Antwerp to London via Spitsbergen, the epicenter for climate change.

In all, this equated to seven months of navigation, 16 stopovers in 11 countries, dealing with all types of weather along the way, with up to 50 knots of wind and icy water, which in principle is unfavorable to fuel cells.

The main challenge involved making the journey from Saint Petersburg to Spitsbergen whilst being entirely self-sufficient in energy and hence without ever electrolysing when not on the move in order to be the first boat to visit Spitsbergen without burning a single drop of fossil fuel. Expedition yachts visit this archipelago on a regular basis of course, but their holds are full of diesel and their generators provide the bulk of the energy.



Overall, for the whole of 2019, the following assessment can be made:



Energy Observer has tested numerous innovations, always with a twofold meeting of minds between sailors and engineers. And always with this pragmatic analysis: is it coherent, reliable and technically and financially accessible?

Ultimately, it's all about taking the systems out of their cosseted laboratories and their norms, dismantling them, modifying them to anticipate real-life conditions, then leading them into very hot, very cold, soaking and highly corrosive environments to see where they will begin to crack... Next, when it holds out, it's about pushing the systems to the limit to get real output and performance data, because we are also competitors from the racing world after all.

As such, after an initial phase of intensive tests, in the Mediterranean heat and then in the chill of the far North, Energy Observer is now switching things up a gear, taking on the two largest oceans with a complete energy chain, designed to be duplicated and accessible to all.

There is no faster or more effective way to validate a product than pushing it to the limit for weeks and months without stopping. This is what car manufacturers do with their new models and it's what Energy Observer is doing with its own systems. Setting sail from Europe in February, the following systems have been validated and loaded aboard to be subject to the trials and tribulations of the open ocean:

• OceanWings® by VPLP and CNIM, developed aboard since 2018. A new optimised and mature version is reassembled in early 2020, following work and development in Amsterdam then in Tromsö in Norway.

This system must be able to withstand a high pace in the trade winds and enable electrolysis of the seawater along the way. From new deck fittings to optimisation of the materials and mechanics, automatic management software and connectors, OceanWings® has been the main focus this winter in order to tackle the oceanic passages lined up for 2020.

Using the wings on a regular basis equates to an energy saving of up to 44% over a typical course. As a result, Energy Observer is working intensively on the system designed by VPLP and built by CNIM and it remains the only development test bed operating in a real-life situation. It's a very promising concept, serving as justification for the great effort involved in its development, with the same criteria for reliability and output as all the other on-board systems.

- Traction kites developed by Beyond the Sea are under development once again, with a new team of engineers supported by an aeronautical group. Energy Observer is closely monitoring any progress made and is this year carrying static Liberty Kites. These wings, which are a lot simpler than those used in 2017 and 2018, may be precious assets were the boat to break down or navigate the trade winds.
- The entire hydrogen production chain, from desalinators to the original fuel cell developed by CEA-Liten.
- → The three-stage desalinator, developed by the French company SLCE, always provide great satisfaction, with much lower consumption than those of other technologies.
- → The electrolyser is still under development at a production Proton Onsite base. Its integration on the boat has been a success and in 2020 the team is hoping to be able to run it a lot more when underway, thanks to additional energy provided by hydrogeneration and OceanWings. Its consumption remains high so it must be compensated for in real time.
- → Compression is still a unit under development, but reliability is improving and above all its energy consumption is becoming marginal, which suggests numerous applications will be possible on remote sites or in the maritime world. The two-stage system (30 to 180 bar, then 180 to 350 bar) developed with the NovaSwiss company has evolved a great deal since the launch of the boat, with numerous material and membrane tests and significant mechanical modifications.



→ Storage to 350 bar, split into 8 Luxfer bottles, identical to those kitting out hundreds of buses around the world, is also a satisfaction. The engineers are primarily working on the corrosion of piping, sensors and high-pressure connectors. The partnership with Swagelok, the global leader in these technologies, should enable reliable solutions to be developed for all hydrogen facilities exposed to tough weather conditions. As long as hydrogen gas remains the standard most used in storage, it's essential for Energy Observer to continue its research in terms of corrosion, especially with regards the high pressure connections and tubing used on boats, in port areas and all remote outdoor stations.



- The fuel cell designed and built specially by the CEA is still remarkably reliable, despite the punishment inflicted on it by the on-board engineers and the moist conditions, impact and temperatures endured since 2017. There was no loss of output, corrosion was well-controlled on the devices, with stable temperatures and good flow suited to maritime use, making it a good laboratory component, even were it to float. The fuel cell worked for over 220 hours in 2019, producing more than 4,400kWh with output in excess of 49%. It consumed around 300kg of hydrogen, produced aboard (with the exception of the initial tank full of green H2 delivered by Air Liquide).
- The control system, which runs all the systems as one, is also a piece of constantly evolving software, but it has now attained a very high level of automation and reliability. Connected to the CAN bus technology which goes right around the boat, it is supplied by thousands of sensors spread across all the compartments. Rockwell, a specialist in industrial automation and control, is still a loyal technological partner to the project.
- \cdot Maritime routing, specially developed to take into account the hours of sunshine as well as the wind and waves, now forms a part of all the piloting software.

It will be further developed in 2020 by a dedicated team at Energy Observer and coupled with pollution sensors.





New technological features for 2020

As is the case every year, the boat has undergone a substantial winter refit to optimise all its systems prior to venturing far and wide for a long period. The main developments for 2020 are:

• A new fuel cell system, developed by Toyota, has been installed in collaboration with engineers from Energy Observer. This fuel cell - air compressor and inverter assembly now occupies a space symmetrical to that of the initial system installed on the starboard side. The maximum power of 114kW (but uses at around 50% with optimized efficiency), its weight and compactness, combined with its proven reliability on thousands of cars and trucks, promises to open many new applications. Put to the test on long ocean crossings, this system is duplicated in Toyota's European Technical Center in Zaventem (Belgium), so that it can accurately monitor its behavior, being exactly identical to what is operational on Energy Observer.

After the time of experimentation, Energy Observer will be entering a more concrete phase: making its technologies technically and financially widespread accessible, starting with maritime and port communities. That is why it is necessary to marinize and validate this mass-produced technology, supplied by a world industrial leader - renowned for the incomparable reliability of products. Energy Observer shares with Toyota, the same values and the same objectives of promoting a clean and responsible hydrogen society.



© Energy Observer Productions - Amélie Conty

The solar panel park has also undergone a revamp with the exploitation of numerous surfaces, even reduced ones. In this way, 36.8m² have been added to the existing 165m² for 5.6Kw of additional power and a total surface area of 202m². As a result, the maximum power will be 34kWc (we've doubled this power since 2017). Vertical panels, at times using screen-printing, will be precisely monitored. Here too, if their use reveals an output coherent with their design, numerous applications will be possible.

The ability to cover walls and entire facades with solar panels, the whole ensemble invisible thanks to the complete screen-printing of these surfaces, would increase the use of solar energy exponentially. Since the start of the project, these solar developments have been carried out with Solbian, which markets the solar panels trialled on Energy Observer.



 Propulsion and hydrogeneration are also witnessing some breakthrough innovations this year. Indeed, some automatic, variable pitch propeller prototypes have been tested. A concept already validated on small boats, this automatic variable pitch system has enjoyed a much more extensive and demanding application on Energy Observer, a large electric and hybrid vessel, navigating long oceanic passages.

These propellers come with the promise that the angle of the blades can be constantly adjusted for optimal use, providing two instant benefits:

- → A gain in speed when the boat is powered by its wings. In fact, the variable pitch enables a boost of speed that extends beyond the windspeed. It also provides greater torque when the boat negotiates a wave and more reach when it is pushed along by the waves. This improvement obviously translates as a slowdown and hence a dip in the electric consumption of the engines if this additional speed is not essential. Energy Observer is convinced by the argument about 'intelligent' speed rather than 'constant pedal to the metal'.
- → These propellers can also be turned round to optimise hydrogeneration. The problem with conventional propellers is that they are designed to push water in one main direction. Their efficiency diminishes when you get them to rotate in the other direction to transform them into turbines. The system tested on Energy Observer enables the blades to be completely inverted, so they are as efficient in one direction as the other.
- → Finally, the blades on these propellers can be feathered, thus reducing their hydrodynamic drag by 85%. This is useful when the batteries and hydrogen tanks are full! Naturally, the complexity of the mechanics and design will require meticulous fine-tuning, coupled with the careful management of Energy Observer's electricpowered motor-generators. Acceleration curves, torque, balanced resistance in hydrogeneration mode... everything has to be rethought and recalculated by automatons, and the engineers and sailors most importantly, so as to bring it in line with reality!



An international multi-partner project

In light of the urgent struggle to combat climate change, it is essential to rethink our model of society: to push the envelope in terms of inter-sectorial cooperation, switch the traditional models of competitiveness, halt the quest for unlimited growth in a world with limited resource...

To take up these challenges, many companies are searching for new models for working together. Energy Observer intends to become a catalyst to enable these committed protagonists to realise their projects and really step things up a gear in terms of ecological transition. In total, there are already 60 companies and institutions from the public and private sector, who are responsible for making this expedition possible.

This adventure exists thanks to the financial, technological and human commitment of a solid cluster of partners, the key ones being:

Accor and AccorInvest, Thélem Insurance, Delanchy Group and Engie. Official partners and sponsors like Toyota and CCR, as well as several official supporters like Air Liquide, Delta Dore, Petit Forestier, the BenTouch Group, Lamotte, Sacib and the Crédit Maritime Grand Ouest, are all making a specific contribution and often become a key player in the programme.

This year, some leading mobility partners are joining the adventure:



© CMA-CGM



Maritime mobility

CMA CGM, a world leader in shipping and logistics and a pioneer in the energy transition, is combining its expertise with the innovation of Energy Observer to make hydrogen one of tomorrow's energies for zero-emission maritime transport. CMA CGM will provide Energy Observer with its R&D experts and maritime and logistics know-how.

Heavy goods vehicle mobility

CHEREAU, the leading manufacturer of trailers, which is developing a cooling system for its trailers using a fuel cell, has teams working with Energy Observer Developments on the optimisation of their energy mix.

Delanchy, the project's historical partner, is the first to utilise this 21st century trailer.

© Chereau



Automotive mobility and decentralised energy

Toyota, already present with its French subsidiary since the launch of the boat, has now taken things to a whole new level by masterfully increasing its technological investment in the project by supplying the boat's hydrogen system with a new heart.

Numerous technological partnerships are enabling progress to made with the on-board systems, including CNIM, which is manufacturing the OceanWings®, HP which is supplying the computer equipment, Solbian with whom we're developing the latest generation solar panels, Rockwell which is supporting the development of automatons, Aquassys which is assisting with the design of heating networks, Swagelok the leader in high-pressure connections, NovaSwiss and its compressors, as well as Plastimo and its innovative safety equipment. The team is carrying out its scientific research in collaboration with the CEA-Liten with whom it shares know-how, patents and licences.

Our institutional partners recognise the innovative, political

and international dimension of the Odyssey, which notably benefits from the official support of the European Commission, and ranks among its partners l'Ademe, UNESCO, IRENA, the Hydrogen Council and the Ministry of Ecological and Inclusive Transition.

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