Energy Observer

Press kit

March 2024

Main partners

Official partners

With the offical support of

Institutional partners

Table of Contents

1 - Presentation

The Energy Observer project was born in 2013 from the commitment of Victorien Erussard, a merchant marine officer and offshore sailor. Aware of the vital importance of taking action for the planet, he gathered around him a team composed of complementary professionals: sailors, scientists, engineers and journalists, in order to create the first autonomous vessel in the world to navigate the oceans using a mix of renewable energies and hydrogen produced on board from sea water.

Launched in 2017, this laboratory vessel has undertaken a 7-year expedition around the world with the aim of championing the sharing of knowledge and sustainable solutions for the future of our planet. She has also been used as a media platform, producing 13 documentary films broadcast on Canal+ and over 500 online videos to shine a spotlight on local innovations and sustainable solutions encountered all over the world.

Energy Observer has received the High Patronage of Mr. Emmanuel Macron, President of the French Republic. It has the official support of the Ministry of Ecological Transition, UNESCO, the European Union, Irena, and Ademe.

The missions of Energy Observer

Innovation to accelerate the energy transition

Energy Observer is a laboratory where engineers and researchers are developing new technologies in order to make low-carbon energies a reality for all. The latest, cutting-edge technologies in terms of hydrogen, batteries, solar and wind power are tested in the most hostile environment: the ocean. These have been optimized over the course of a 62,000 nautical miles voyage. The variety and diversity of renewable energies are central to resilient low-carbon energy systems developed by our engineers with the support of our manufacturing partners. The development of reliable, sustainable, noise-free, affordable energy solutions lies at the heart of the challenges of this Odyssey, with the aim of applying them on a large scale to reduce society's carbon footprint.

A journey of exploration into the initiatives changing our world

The Energy Observer adventure is a historic 7-year around-the-world Odyssey to meet the pioneers breaking new ground to safeguard the planet by reinventing energy, economy, mobility, and by finding solutions for protecting biodiversity.

These positive and practical innovations are already up and running and show that another world and another future are possible. As the first French ambassador of the 17 Sustainable Development Goals set by the UN in 2015, Energy Observer carries France's message on the urgent need to preserve the planet.

Raising awareness

At each stopover, the team meets up with the women and men who are championing innovative, local and replicable projects.

Moreover, at each of the Odyssey's major stopovers, an exhibition village is rolled out. Free to access, it is designed to raise awareness among all public audiences about the challenges of energy and ecological transition. Local families, students, schoolchildren, elected representatives and industrial decision-makers are invited to immerse themselves in the Energy Observer adventure and have some fun along the way.

2- 2017 – 2024
The Odyssey's key figures

7 years of sailing

- France, 2017
- Mediterranean, 2018
- Northern Europe, 2019
- Atlantic, 2020
- Pacific, 2021
- Asia, 2022
- Africa and Brazil, 2023
- America, 2024

4 oceans crossing

- Atlantic Ocean, 2020
- Pacific Ocean, 2021
- Indian Ocean, 2022
- Atlantic Ocean, 2023 & 2024

40 + visited countries

86 stopovers

including 17 with the traveling village
+ de 350,000 visitors

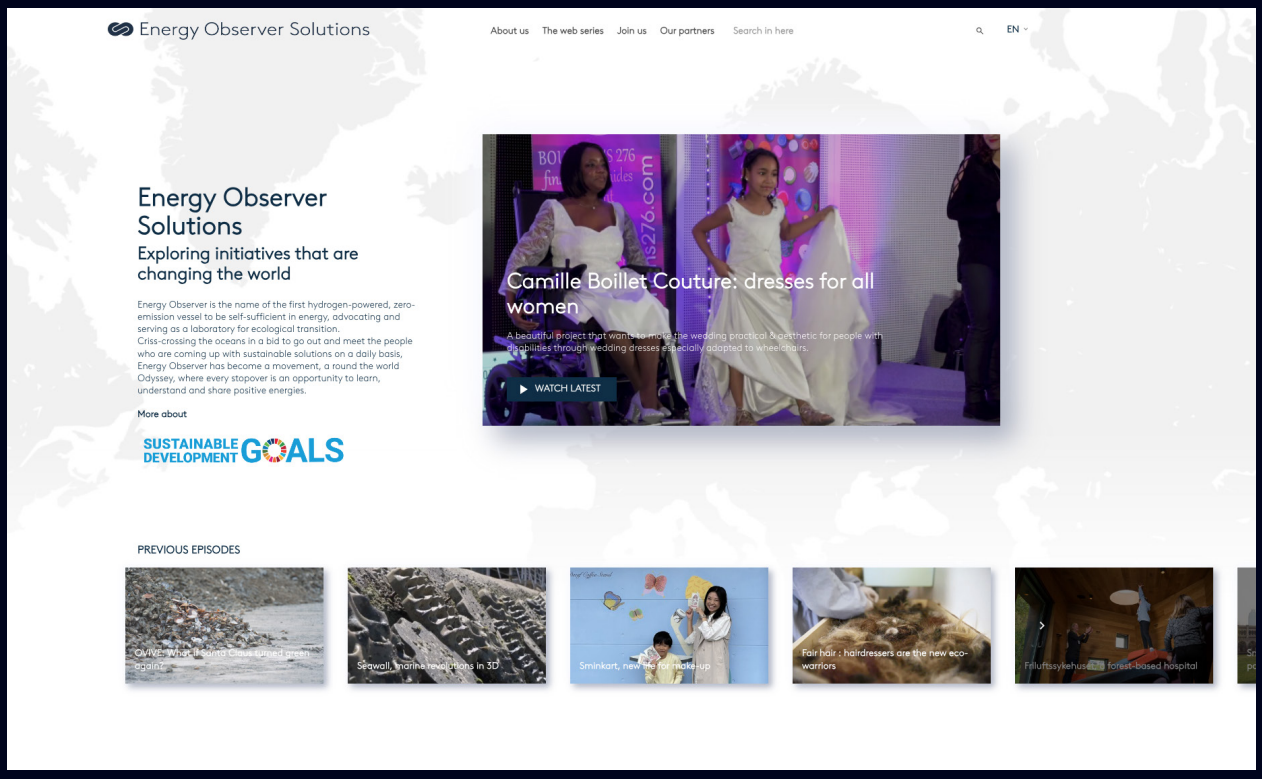
62,000 + nautical miles sailed

2- 2017 – 2024
The Odyssey's key figures

13 films
produced

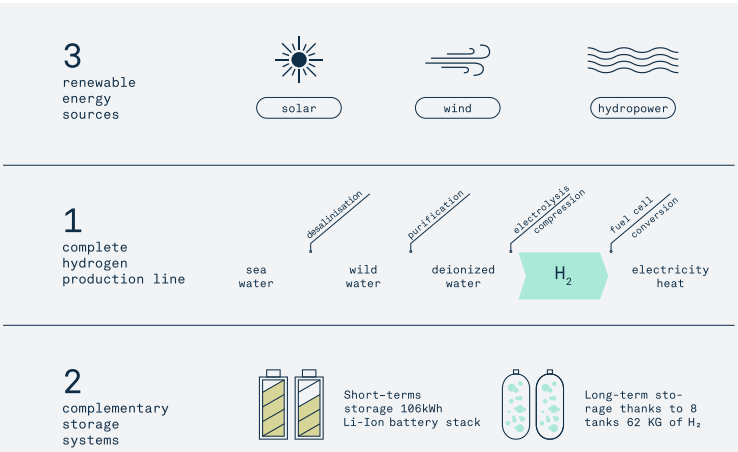
75 + episodes
of the Energy Observer web series Solutions produced and broadcast

400 + short reports
on our YouTube broadcast



A reliable energy mix

On board technologies, combining multiple sources -solar, wind and hydropower- and a range of energy storage devices, batteries and above all hydrogen, are the forerunners of tomorrow's smart energy grids, which can be reproduced on a large scale, everywhere and for everyone.

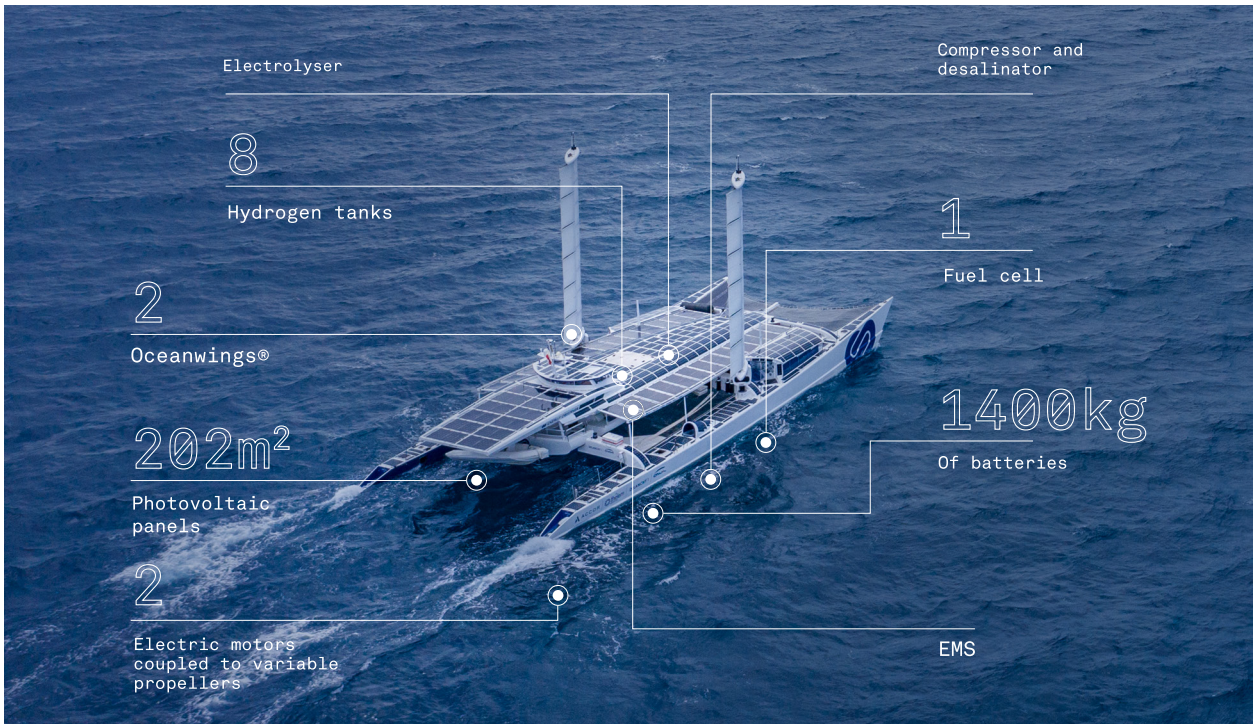


Hydrogen, the keystone of the Energy Observer system

To date, hydrogen is the best ally of the renewable energies. It is the lightest and most abundant chemical element in the universe, and has an energy density three times higher than traditional fuels. As a result, hydrogen allows the storage of excess energy from renewable sources and makes it possible to offset their intermittence. If Energy Observer had to store its energy in traditional batteries alone, the boat would weigh twice as much!

Today, the 62 kilos of hydrogen stored on board provide 1 MWh of electricity and 1 MWh of heat, which represents the average consumption of a four-person household for a month. While maritime and land mobility meet the ever-increasing demands for power, speed and reliability, hydrogen is currently one of the energy carriers that offers a credible alternative to fossil fuels without impacting the environment.

By testing an energy system based on a mix of renewable energies and hydrogen produced on board by electrolysis of sea water, Energy Observer is paving the way for multiple land and maritime applications that can be replicated at the level of a user, a neighborhood or even an entire city.



The energy aboard Energy Observer

Technologies appraisal

The vessel passed the symbolic milestone of 62,000 nautical miles before arriving in Brazil last December. 2023 was filled with repair and optimisation work organised aboard the boat, as 2022 was a trying year for all the systems, which had to cope with some very high temperatures, often troubled waters and a maintenance issue in Malaysia. The entire high-pressure system was dismantled and revised in Cape Town following some extensive work on the solar power in the Indian Ocean.

Hydrogen

Desalination

The desalination system installed on board continues to yield very good results. Consisting of three successive stages of desalinators with excellent efficiency from the Breton company SLCE located near Lorient, they underwent a substantial overhaul in 2022 and 2023. The waters of the ports of Indonesia, Singapore, Langkawi, Cochin then Port Elizabeth, Durban and Cape Town called for routine maintenance of the system, but the ensemble worked perfectly, supplying the crew with fresh water and above all high-quality deionised water for the electrolyzer.

Electrolyzer

Still based on a Proton Onsite system specially converted by Energy Observer's engineers, the on-board electrolyzer is also highly satisfying to be highly satisfactory. It can produce up to 8 kg of green hydrogen per day (4 Nm3/hr being its nominal production). Its electricity consumption (7 kWh/Nm3) prompts the crew to electrolyse dockside or at anchor, whenever there isn't too much other simultaneous heavy consumption, though theoretically it is possible to electrolyse whilst under way once the OceanWings provide enough thrust to keep the vessel moving. More than 300 kg of green hydrogen was produced aboard in 2023.

Compression

Onboard energy storage being achieved with hydrogen compressed at 350 bars in composite tanks, two stages of compression are required for storing enough hydrogen (up to 62 kg split across eight tanks). The compressors available on the market are for fixed stations, which means they're much to heavy and cumbersome to carry aboard. As such, two specific stages of compression have been developed with Nova Swiss: the first from 30 bars (electrolyzer outlet pressure) to 180 bars, then a second from 180 to 350 bars. Since 2017, these compressors have required a great deal of fine-tuning and consumed numerous membranes of all types of materials. Nova Swiss has supported these developments by providing a regular supply of components and dispatching their technicians to the vessel's key optimization refits.

In 2023, a further substantial maintenance operation on the compressors was organised in the Seychelles to ensure the system operates correctly: new membranes, dismantling of the compressors and pressure testing across the whole of the on-board hydrogen network.

Tanks

The Luxfer tanks mounted on the boat since 2017 also underwent a very significant upgrade operation in Cape Town, in collaboration with Air Liquide and EO Concept engineers. For the first time, the tanks were removed from their housings on the deck of the vessel, and the heads equipped with sensors and responsible for controlling the flows were changed after nitrogen inertia. Energy Observer's engineers were able to introduce an endoscopic camera inside the tanks to meticulously inspect the condition of the internal liner. No defects were revealed after seven years of faithful service. The entire circuit was then subjected to pressure tests before being restarted and operated at full capacity to make landfall in Brazil.

Fuel cell

The Toyota fuel cell, which powers the onboard electrical production system, underwent a major overhaul in Malaysia, mainly due to doubts about certain cooling peripherals. This module still operates at a power of 70 kW, which is the best compromise in terms of performance. Specifically designed to operate on a boat, hence with a temperature exchanger (rather than a radiator system like in hydrogen cars), the cooling system is a special development for the vessel, as is the air intake, which must cope with the moisture and salinity. It is worth noting that a clone of the system is also operational at Toyota Europe's R&D center, and that other similar systems (named REXH2) are distributed worldwide by Energy Observer Developments. Therefore, Energy Observer remains an essential floating laboratory for optimizing the lifespan and reliability of the entire system, thus enabling predictive maintenance of all other REXH2 units in operation.

Solar

The bifacial photovoltaic panels developed by the INES (Institut National de l'Energie Solaire) on the vessel's side wings and aft section were installed in 2016-2017. Particularly exposed in the waves, especially those forward of the side wings, a lot of them have suffered material damage after being slammed into by powerful waves, especially during the passage across the Pacific. As a result, a dip in overall efficiency was observed with these bifacial panels and some have had to be replaced. Some panels have also suffered water ingress in their encapsulation, again due to the waves washing over the decks during sea passages in some very rough weather and heavy waves.

The flexible solar panels all over the vessel form part of a very active partnership with Solbian, their Italian manufacturer. Innovations in terms of polymers, adhesives and contactors are all tested aboard the vessel, which means that their performance is closely followed using monitoring software developed aboard the boat (Energy Management System). Some innovative materials did not withstand the heat of Southeast Asia, and other components also experienced premature aging. Each time, Solbian retrieves the damaged parts (or recycles them in Energy Observer's stopover countries) and replaces them with corrected upgrades. In this way, Energy Observer is a genuine test laboratory for maritime solar innovations in extreme situations, which undergo constant optimization aboard. Some of the used panels have also been donated for educational purposes.

© Jérémy Bidon

© Jérémy Bidon

Wind propulsion

Aboard Energy Observer since 2019 are two automatic OceanWings measuring 32 sqm, designed by VPLP and now monitored by Ayro. The laboratory vessel is developped the only examples of these innovative systems operating in real conditions on a daily basis. This development includes an optimised fit-out and assembly, the regular replacement of components and the provision of data for operating these wings. In Malaysia, major electro-mechanical maintenance and optimisation work were carried out with Ayro.

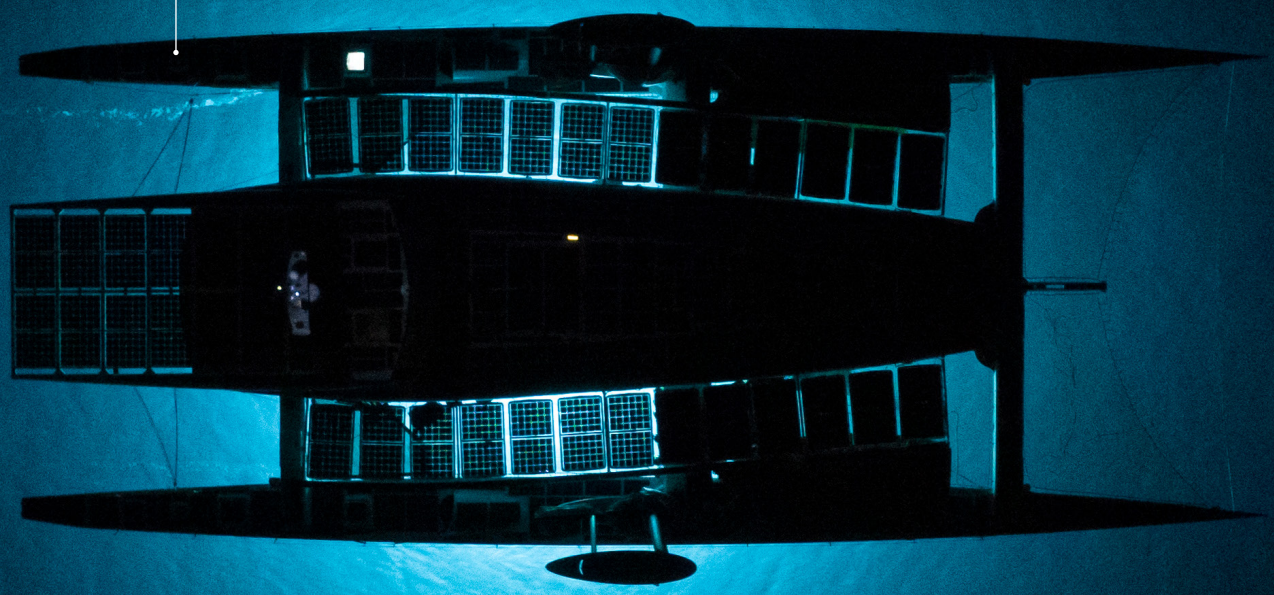
Since their installation in 2019, they've covered tens of thousands of nautical miles and the crew reckons that their contribution to the vessel's propulsion equates to around 30%. This contribution speaks for itself in the trade wind and in steady downwind conditions, making it possible to reach speeds in excess of 12 knots without impacting the boat's average electricity consumption. For Energy Observer, once its development is successfully completed, the system is today's most promising and most accessible automatic wind turbine system.

From now on, the Canopée vessel chartered by Ariane Espace also uses this system on a much broader scale, demonstrating that the investments made by Energy Observer have true, practical, industrial applications for maritime actors.

Overall, the systems developed on Energy Observer prove that energy diversity is the key to unlimited autonomy. The objective now is to continue innovating while giving absolute priority to the reliability and durability of all developed technologies. This is to convince maritime communities that their usage is now mature.

3 - The 2024 navigation schedule

After 2023 was spent navigating the waters between Africa and Brazil, Energy Observer is now setting off on the final nautical miles of her expedition. For the first time, the laboratory vessel is making her way down America's eastern seaboard, where she'll make several publicity stopovers, before setting a course for her port of registry: Saint Malo.




St-Johns
19 — 22th May
St-Malo
14 — 23th June
Paris
july — October
Boston
1th — 5th May
Washington
14 — 20th March
New-York City
10 — 22th April
Miami
26 feb. — 3rd March

A resourceful and complementary team

© Energy Observer Productions - Francine Kreiss

→ Victorien Erussard
Chairman, founder and captain

As a versatile officer in the merchant navy, he has sailed on several merchant ships 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 despite being surrounded by solar, wind power and hydropower and Victorien realized 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.

Aboard the boat, professional sailors and their crew guide the expedition by this extraordinary vessel, technicians and engineers ensure the on-board systems work well, whilst the reporters and film crew document the stopovers and provide an insight into Energy Observer's meetings with the pioneers of change.

© Energy Observer Productions - Mélanie de Groot Van Embden

4 - An SDGs ambassador role strengthened by the development of the Endowment Fund

17 goals, a genuine roadmap for sustainable development

Appointed first French Ambassador for the Sustainable Development Goals by the Ministry of the Ecological transition, Energy Observer's mission is to accelerate the energy and ecological transition through the promotion of local initiatives and sustainable solutions for the planet.

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 around these innovators to promote their local initiatives and actions in terms of the circular economy, responsible consumption, activities promoting gender equality, reasoned and responsible agriculture, protection of life on land and at sea and so on. This ambassador role role is emphasized during the stopovers, but also through documentary films and the “Energy Observer Solutions” digital platform. This platform promotes the solutions encountered around the world and educates about the 17 Sustainable Development Goals and their interrelationship. Doing so, Energy Observer builds a database of “Solutions”, a silver lining of positive and inspiring actions around the world, despite the multiple challenges faced by humanity. Thousands of protagonists globally are working to make this world a better place, and they deserve to be known.

Energy Observer Solutions

Energy Observer Solutions is a digital platform launched in 2019, though production began from the very start of the project. 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 on the Energy Observer Solutions platform and illustrated in a web series of short episodes through the prism of Sustainable Development Goals, in connection with the Ministry of the Ecological 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 with a tone and format geared around the social networks, are aimed at publicising the actions of these change-makers outside their home countries by showcasing their solutions and their local projects. It is one of the actions most strongly backed by the Energy Observer Foundation.

Educational editorial and audiovisual programs

Energy Observer has produced nearly 13 documentaries since its launch:

→ A series of 12 documentaries broadcast on the Canal + Group channels, "Energy Observer, the Odyssey for the Future ®". From Saint Malo to Saint Petersburg, this collection of films recounts the lives of the crew aboard Energy Observer and their encounters around the world.

→ A 90-minute prime time broadcast for 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.

Other science-focused documentaries are expected to emerge and address major societal issues related to energy and biodiversity.

Live content from the ship

Energy Observer also shares live content: log books about the highlights of the Odyssey highlights (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.

© Energy Observer Productions - Francine Kreiss

Energy Observer Foundation

Combining expertise to accelerate energy transition, raise awareness about the potential of hydrogen and promote the Sustainable Development goals

In addition to the numerous encounters throughout the Odyssey, Energy Observer has been stepping up the development of its 'non-profit' activities since 2020, at the forefront of which the focus is on raising awareness about the 17 Sustainable Development Goals, via an Energy Observer Foundation endowment fund. To increase its impact, three new priority areas now lie at the heart of its general interest mission.

Combining expertise for a practical way to accelerate energy transition and combat marine pollution.

Understanding, explaining the complex and changing challenges of this transition within the scope of a major energy crisis. Optimizing the daily use of energy, reducing fossil fuels in favor of renewable energies, switching lifestyles to better respect our environment, demonstrating energy sobriety: such are the challenges that must be taken up today. They'll require a profound and lasting transformation of every sector relating to energy, production and consumption.
The same is true for the maritime sector, which is responsible for nearly 3% of the world's greenhouse gas emissions. This will notably require research and innovation to come up with low-carbon solutions and remove existing obstacles in a bid to design a freighter for professional use, this time running on liquid hydrogen.

Raising awareness and passing on our feedback and know-how in the domain of hydrogen and sustainable energies. Hydrogen is one of the key elements in energy transition. It plays a fundamental role in the decarbonisation of its various uses, be they mobile, terrestrial or industrial applications.

The Energy Observer Foundation is taking action to help develop the hydrogen society, remove the obstacles which limit its growth, and guide youngsters towards the new professions of the future it offers. The co-construction of a series of two conferences about the cycle of hydrogen values and decarbonisation and territories with the Hotel de L'Industrie is one of the Endowment Fund's greatest accomplishments within this context.

Broadcast, promote the 17 Sustainable Development Goals, raise awareness, help change behaviours. The SDGs adopted in September 2015 by the UN within the scope of the 2030 agenda are fundamental. They provide a course backed up by numbers, a common language and a universal road map. Within the scope of the diplomatic mission entrusted to Victorien Erussard, Energy Observer Foundation is spreading France's message about the need to take action with regard to all aspects of ecological transition, with the hope of inspiring the greatest number of people. The aim also includes nurturing consideration in France and internationally of these 17 SDGs, where the interconnection of the economic, social and environmental issues is well-established, and expand their notoriety in the tradition of the awareness-raising activities carried out since the start of the Odyssey (through the Solutions platform, exhibitions and educational tools...).

© Energy Observer Productions - Antoine Drancey

5 - An immersive exhibition

© Thibault Voisin

Throughout the Odyssey, a travelling village is deployed during the main stopovers around the world. Open to the public and free of charge, it is the flagship tool of Energy Observer Foundation. Through an interactive and educational exhibition, as well as projections, it is a real window on the world of today and tomorrow. It is a place of meetings, exchanges and discoveries on the theme of the energy and ecological transition which has welcomed welcomed more than 350,000 visitors over the last 5 years.

The visitors' journey is punctuated by different themes around the laboratory vessel such as the onboard technologies, the leading ports of call, the role of ambassador as well as the concrete applications that can be developed at sea and on land, the stakes of the energy transition in the ecological transition, the place of hydrogen in the energy transition, the missions of Energy Observer Foundation and its main activites, including Energy Observer Solutions. The exhibition also includes a historical timeline designed in partnership with Ademe which mixes the main dates of the energy transition and ecological awareness with those of the Energy Observer laboratory.

The objective of this exhibition is clear: to show that the development of renewable energies, green hydrogen and the intelligent energy mix is an answer to climate emergency.

6 - An international multi-partner project

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

To take up these challenges, many companies are searching for new models and 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 all, there are already 60 companies and institutions from the public and private sector which 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 assurances, Air Liquide and BPCE. Official partners and sponsors like Delanchy, Toyota, Triangle Interim, Qair and GUYOT environnement as well as several official supporters like Petit Forestier, Groupe BenTouch, Lamotte Immobilier and Visiativ, are all making a specific contribution and often become a key player in the programme.

7 - Energy Observer 2, decarbonising sea transport

Energy Observer reaches a new milestone by launching the design of Energy Observer 2, a multipurpose cargo ship that runs on liquid hydrogen, a technology making it possible to navigate the oceans using zero emissions, whilst offering very large transport capacities and great range.

160 metres long, a total deadweight of 12,000 tonnes, a carrying capacity of 1,100 containers TEU, 42 tonnes of liquid hydrogen on board and an intended range of 1,800 nautical miles: this cargo ship aims to be the best low-carbon vessel in a segment that equates to a third of today's global fleet.

The integration of high-power modules designed around industrial batteries and adapted to the use of liquid hydrogen will be taken charge of by EODev.

The architecture was designed by LMG Marin, known for having developed Hydra, the first hydrogen-powered ferry to be delivered to Norway in July 2021. The architecture was designed by LMG Marin, known for having developed Hydra, the first hydrogen-powered ferry to be delivered to Norway in July 2021.

Presented on 10 February 2022 at the One Ocean Summit in Brest, the project is due to hit the water in 2026, followed by a lengthy campaign of testing along the European coast, before its future use within a French-flagged commercial operation in 2027.

This 7-year Odyssey has proved to the Energy Observer team that there is a genuine need to develop low-carbon solutions for maritime transport, suited to coastal and intra-European sea passages. For storage reasons in particular, hydrogen is particularly suited to these types of vessels.

Liquid hydrogen requires the implementation of new logistics for this specific use of maritime transport. All the protagonists of this ecosystem are very involved in the large-scale development of this new shared port space.

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