July 2022

We develop and industrialize sustainable, reliable and affordable hydrogen-based energy solutions

EODev

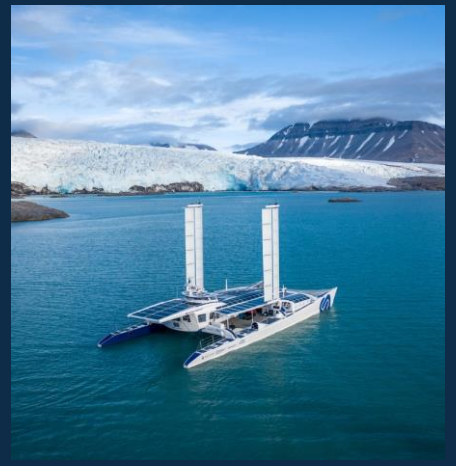
Time to shift

The Energy Observer Group

From an odyssey around the world to the development and industrialization of cutting edge hydrogen technologies

Energy Observer

The first hydrogen-powered, zero-emission vessel to be self-sufficient in energy, advocating and serving as a laboratory for ecological transition



Energy Observer Foundation

Bringing skills together, raising awarness of hydrogen's potential and promoting the UN 17 Sustainable Development Goals

Energy Observer Productions

Producing multimedia audiovisual content to inform and inspire all audiences

30 people

Energy Observer Developments (EODev)

Designing, industrializing and commercializing sustainable, reliable and affordable hydrogen-based energy solutions

60 people

EODev

About EODev

Created in 2019

60 passionate people

40 M€ raised

Patented technology

Production capacity of 600 units

3 sites in France

Our shareholders

ACCOR

Energy Observer

Groupe Monnoyeur

thélem assurances

TOYOTA

AMFIL

Our industrial partners

TOYOTA	Industrial fuel cell supplier
EVE SYSTEM	Development of custom EPMS & batteries
Eneria	Assembly and maintenance of EODev products

EODev

GEH2®

The hydrogen fuel cell power generator

GEH2®: the hydrogen power generator

In case of grid failure or simply when you go off-grid, the GEH2 electro-hydrogen generator brings you the power you need quietly, without CO2 emissions or fine particles.

Reliable

Running exclusively on hydrogen, the GEH2 is equipped with the latest generation of fuel cell from our partner Toyota, giving it an exceptional reliability and a record life span.

Efficient

The combined use of a fuel cell and a battery allow for an optimized efficiency and an unmatched responsiveness. The overall electrical efficiency of the GEH2 exceeds 45% regardless of the load when a diesel genset barely reaches 30% at its best.

Easy to use

Easily handled by crane or forklift, the GEH2 offers a user friendly touch interface and a remote control option. Connect it to a hydrogen bundle, turn it on, power your application. It is that simple.

Scalable

GEH2 units can be parallelized to meet your power requirement. It can also be connected to diesel or gas generators for peak shaving purposes and even to the grid.

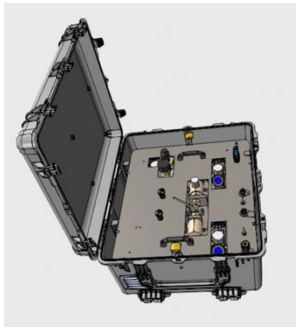
EODev

How it works

External pressurized hydrogen storage

H_2

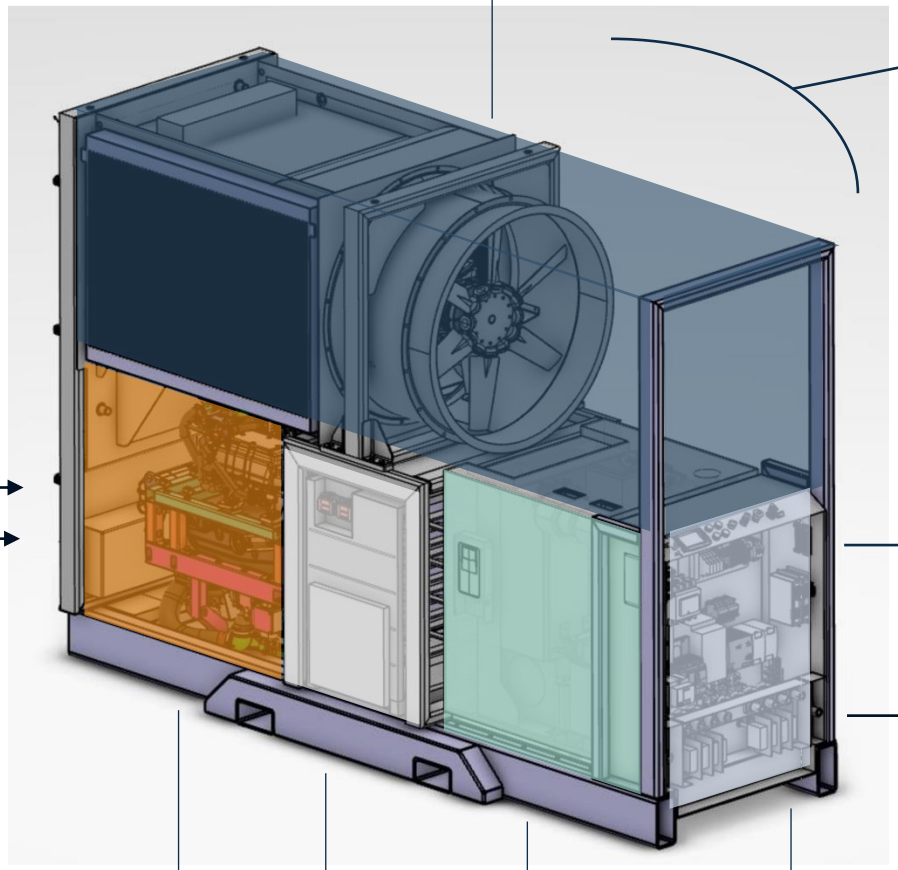
Double hydrogen adduction pressure management box



O_2

Oxygen from the air

Cooling system



Fuel cell

44kWh battery

DC/AC power conversion

Human machine interface & power oulets

Cloud data acquisition and monitoring

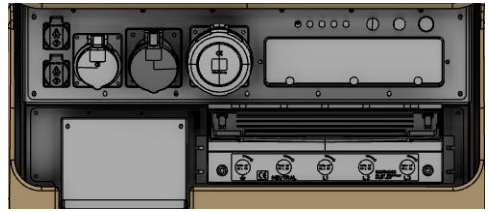
16A–230V

32A–400V

63A–400V

125A–400V

Fuse box



Terminal block

Powerlocks box

H_2O & heat

The transformation of hydrogen and oxygen into electricity creates water and heat as by-products

EODev

REXH2®

The on-board hydrogen fuel cell power generator

REXH2®: the onboard hydrogen power generator

The REXH2 is an onboard hydrogen fuel cell system designed to power the propulsion or the hotel load of all types of boat quietly, without vibrations, CO2 emissions or fine particles.

Reliable

Running exclusively on hydrogen, the REXH2 is equipped with the latest generation of fuel cell from our partner Toyota, giving it an exceptional reliability and a record life span. It was tested in the harshest conditions around the world on Energy Observer.

Efficient

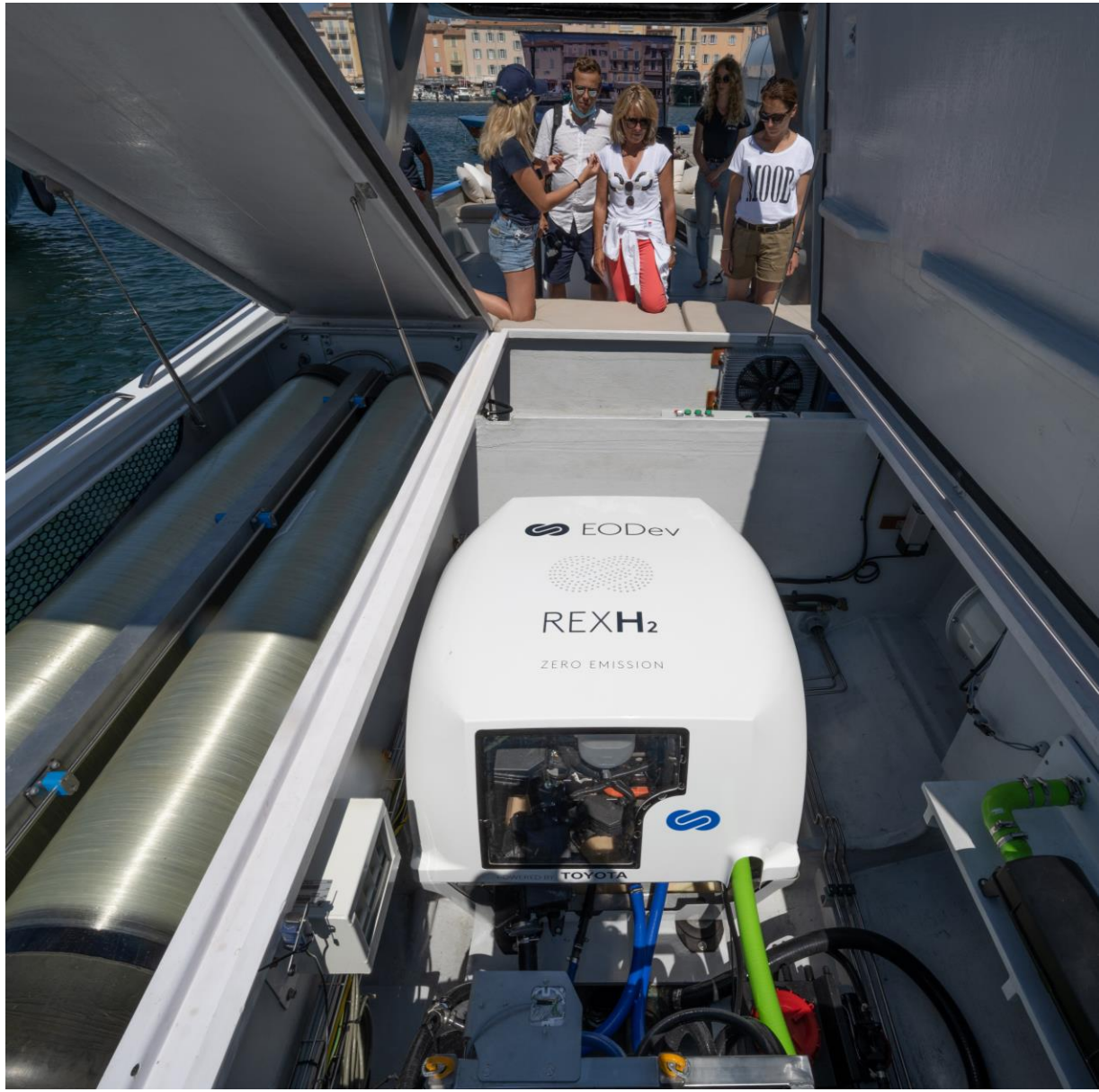
The REXH2 is both efficient at sea, with an electrical efficiency exceeding 50% regardless of the load, and at the harbor thanks to the quick hydrogen refueling. Iit combines the carbon neutrality of batteries with the convenience of diesel.

Plug & play

The REXH2 can be fitted into all types of boats, from cargo vessels to passenger shuttles to barges to professional boats and small and large pleasure vessels.

Modular

REXH2 units can be stacked but also combined with batteries to meet power requirements in MW and optimal efficiency. This flexibility in the implementation makes of the REXH2 the ideal vector for tailor-made hydrogen solutions for propulsion and the supply of carbon-free energy at sea.

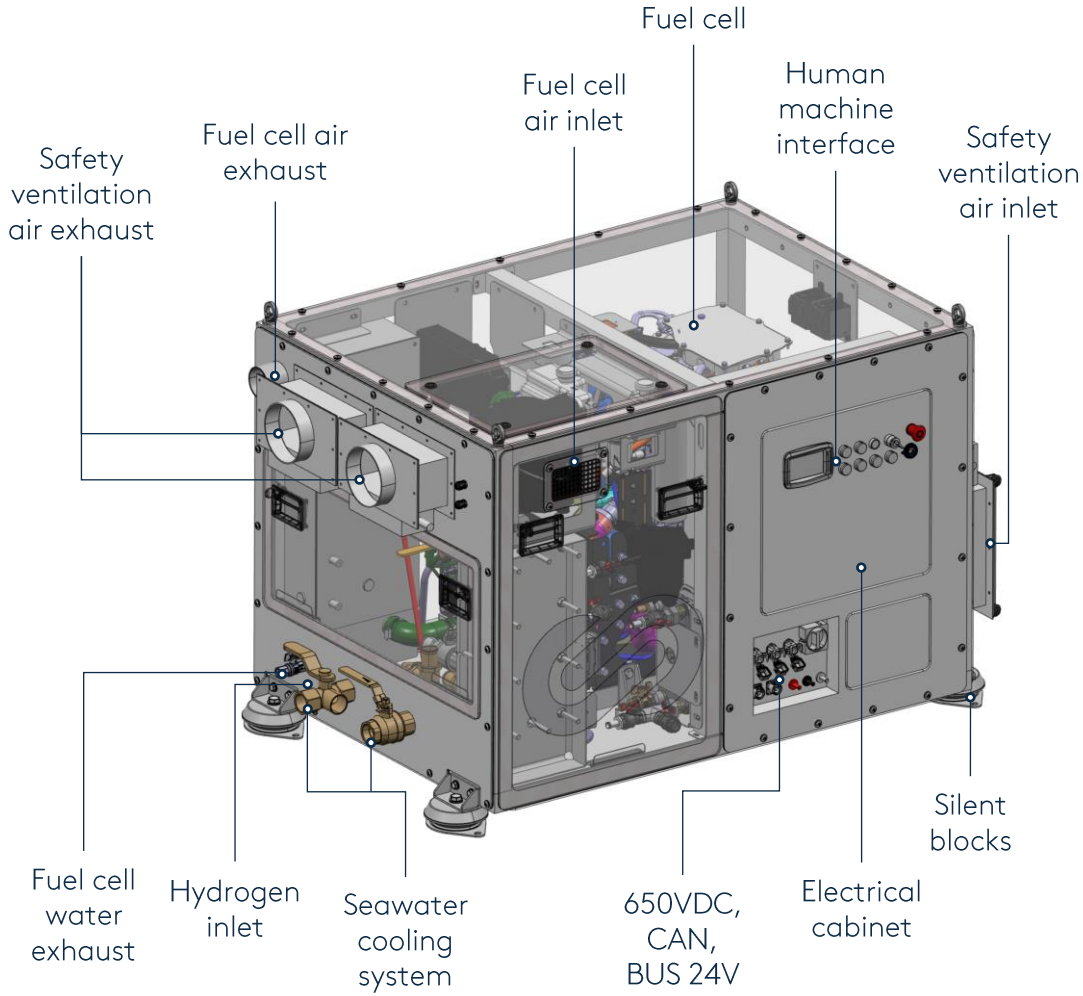


EODev

How it works

H_2 On-board pressurized hydrogen storage

O_2 Oxygen from the air



e^- Zero emission electricity

Electric engine

Hotel load

H_2O Water & heat as by-products

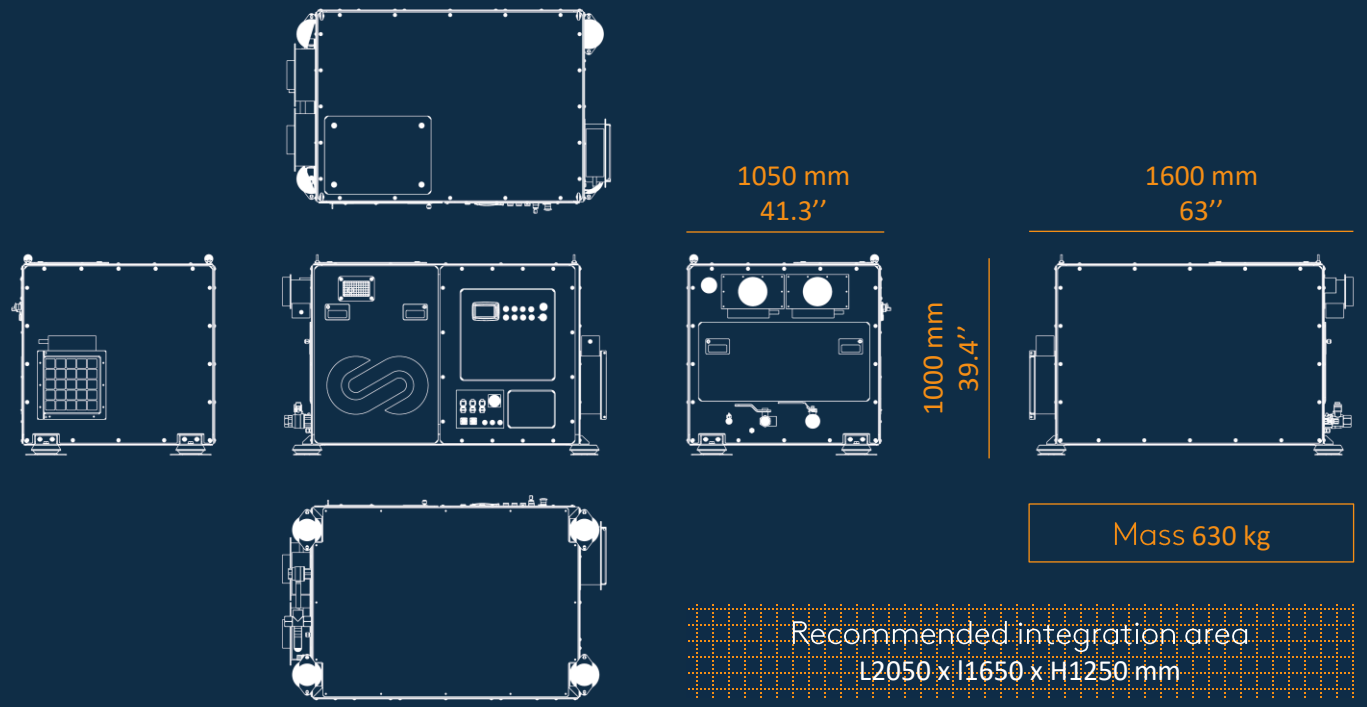
EODev

REXH2

The REXH2 by the numbers

Performances	
Power output	70 kW
Voltage output	600-725 VDC
Hydrogen consumption	4.6 kg /h
Water production	50 l/h
GHG emissions (CO2)	0
Polluants emissions (NOx, PM)	0
Noise level at 1m 50H	Ongoing test
Communication & monitoring	CAN, NMEA, Wifi, 4/5G

Technology	
Fuel cell brand	Toyota
Fuel cell type	PEM
Hydrogen pressure inlet	11-15 bars



Operating environment	
Ambient air temperature	-15°C to 40°C
Ventilation air flow requirement	8000 Nl/m
Seawater temperature and flow requirement	Up to 32°C at 200 l/m
IP classification	IP 52 (IP 56 in option)

Rank 1 suppliers origin

EODev

Key performance indicators

100 kW 6 hours of navigation	Diesel	Electrical	Hydrogen
Environmental efficiency			
Emissions	CO_2 NO_x		H_2O
Access to protected zones	No	Yes	Yes
Noise			
Recharging / Refueling time	10 min	15h (Fast recharging)	10 min
Consumption	200 L diesel	700 kWh electricity	40 kg hydrogen
Weight (engine + fuel / energy source)			
Total volume			
Implementation cost	$	$ $ $	$ $
Energy cost	$	$ $	$ $ $
Energy cost evolution	↗	→	↘
Energy density	++	+	+++

H_2 + Battery vs. Battery Alone

↓

Twice as much energy storage capacity for the same volume

Potential of 10,000 cycles compared to 3,000 for a Li-ion battery

Hydrogen refueling time as fast as filling up a tank with traditional fuel

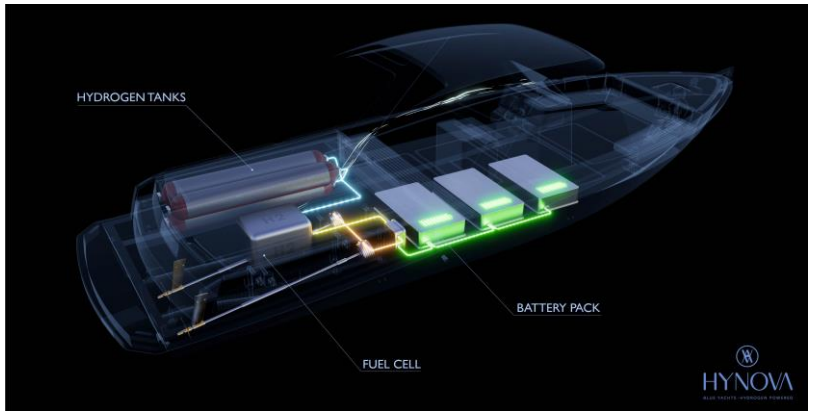
Mass : 7 times lighter

Price : 3 times less expensive

Price per kWh roughly equal to diesel price

HYNOVA

A revolution in the world of navigation: HYNOVA 40 is the first production pleasure craft with electro-hydrogen propulsion receiving a class approval certification for cruising, using hydrogen stored on board to navigate without CO2 emissions, Nox, noise pollution and no risk of diesel fuel leaks.



Chloé Zaied, CEO HYNOVA Yachts

« I am proud that we are the first company in the world to mass-market pleasure boats equipped with this innovative technology and unique process. And I am really happy to share this wonderful adventure with EODev. »

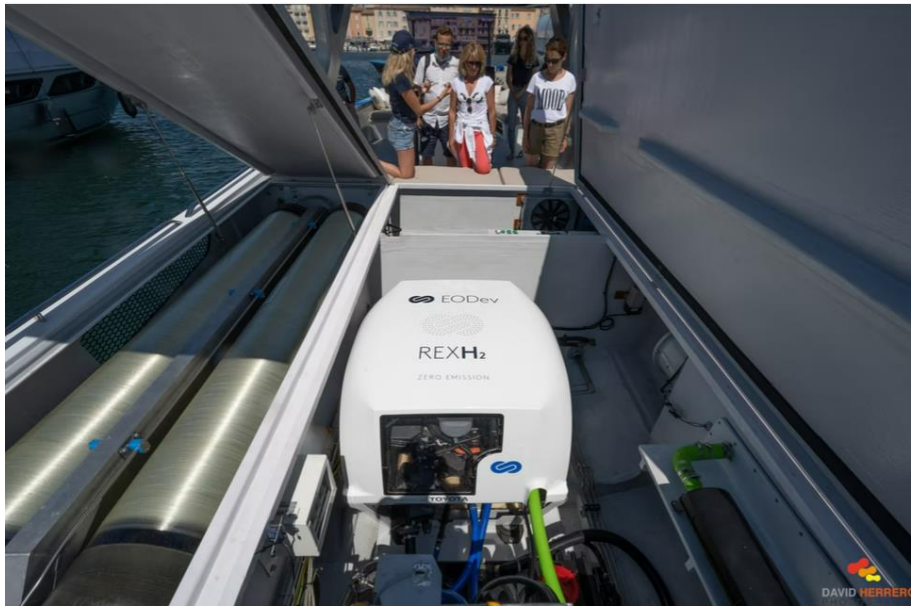
EODev

HYNOVA 40

- Day-boat or superyacht tender, 12m (40ft)
- 2x motors 184kW (equivalent 2x 250HP Diesel)
- 1 REXH2 (fuel cell 60kW) + 3 batteries (3x 44,2 kWh)
- Maximum speed : 22 knots
- Working speed : 12 knots
- Operating speed only fuel cell : 10 knots

- Hydrogen storage pressure : 350bar
- Quantity of hydrogen stored : 22,5kg
- Boat total weight : 8,5 tons
- Boat total weight with same energy density, but purely electric :
  - 12 batteries, 12 tons

H2 + battery solution saving 3,5 tonnes, increasing boat performance and therefore saving energy



HYNOVA 42

- Day-boat or superyacht tender, 12,8m
- 2x motors 184kW (equivalent 2x 250HP Diesel)
- 2 REXH2 (2x 70kW fuel cell) + 2 batteries (2x 44,2 kWh)
- Estimated launch date : 09/2022

- Hydrogen storage pressure : 350bar
- Quantity of hydrogen stored : from 30 to 37 kg

More power, autonomy and redundant solution

Fountaine Pajot

Fountaine Pajot, the world's number two designer and manufacturer of cruising catamarans, became the first major shipyard to integrate hydrogen as an energy solution on board its boats with EODev's REXH2.

The REXH2 will power all the hotel load of the SAMANA 59, from lighting to the galley, the appliances and the air conditioning without the need of a noisy and polluting diesel generator.

It is thus the ideal solution when the boat is at anchor, allowing the passengers to enjoy the sea and swimming in total quietness.

Romain Motteau, CEO Fountaine Pajot

« The choice of EODev's technology is the illustration of our desire to bring together experts in solutions that benefit everyone, and to give substance to our ambition to achieve zero carbon emissions by 2050, whether for the production of boats or their use.»

EODev

SAMANA 59

- Cruising Catamaran, 18m
- Exploitation site : Caribbean
- REXH2 used for hotel load only, and propulsion if required
- Autonomy of 2 weeks
- 2 hydrogen tanks (15 kg)
- Hydrogen storage pressure : 350bar
- Estimated integration date : 09/2022.

Application : Zero emission cruising and propulsion when required

Olympic shuttles

EODev and its partner Neptech and Toyota won the « Olympic and Paralympic Games Paris 2024 Mobilities » call for innovations in the New Mobilities & Active Mobilities category.

The project, selected among 120 applications, aims at designing and operating passenger shuttles equipped with a hydrogen propulsion system on the Seine and in Marseille during the OPG 2024.

Powered by EODev's REXH2 units, the boats will have a long range and will be able to carry up to 150 passengers.

The reduction in CO2 emissions is estimated at 1,100 tonnes per year per ship on average.

Tanguy Goetz, CEO Neptech

« We are delighted to contribute with EODev to the emergence of a responsible and innovative transport solution. Being the winner of this call for mobility innovation will undoubtedly facilitate the long-term deployment of our solutions in the territories of the JOP 2024..»

EODev

Olympic Shuttle

- Passenger ship, 18m
- Exploitation site : Paris and Marseille
- REXH2 used for hotel load and propulsion
- 2 REXH2 (2x 70kW fuel cell) + 5 batteries (5x44,2 kWh)
- Day usage, batteries and hydrogen refill during the night
- Exploitation of around 10h per day
  - Average speed Marseille : 18 knots
  - Average speed Paris : 6 knots
- 8 to 11 hydrogen tanks (60 to 80kg of hydrogen stored)
- Hydrogen storage pressure : 350bar
- Estimated launch date : 2024

Solution for Zero-emission tourism transportation

EODev

Fishing boat - LPMA

- Fishing boat, 20m
- Exploitation site : Corsica
- REXH2 used for hotel load and propulsion
- 2 REXH2 (2x 70kW fuel cell) + 8 batteries (8x44,2 kWh)
- Day usage, batteries and hydrogen refill overnight
- Exploitation of around 10h per day
- Maximum speed : 14 knots
- 9 hydrogen tanks (67,5 kg of hydrogen stored)
- Hydrogen storage pressure : 350bar
- Estimated integration date : 01/2023

Zero-emission fishing boat for the professionalization of future fishing professionals

EODev

First customer references 2021 & 2022 (1)

Loxam (France & Europe)

Enedis (France)

Toyota Australia (International)

Hynova 40 (France)

Gaussin (International)

Eneria CAT (France)

First customer references 2021 & 2022 (2)

GL events (International)

Blue Diamond Machinery (International)

Flow Solutions (International)

Hynova 42 (France)

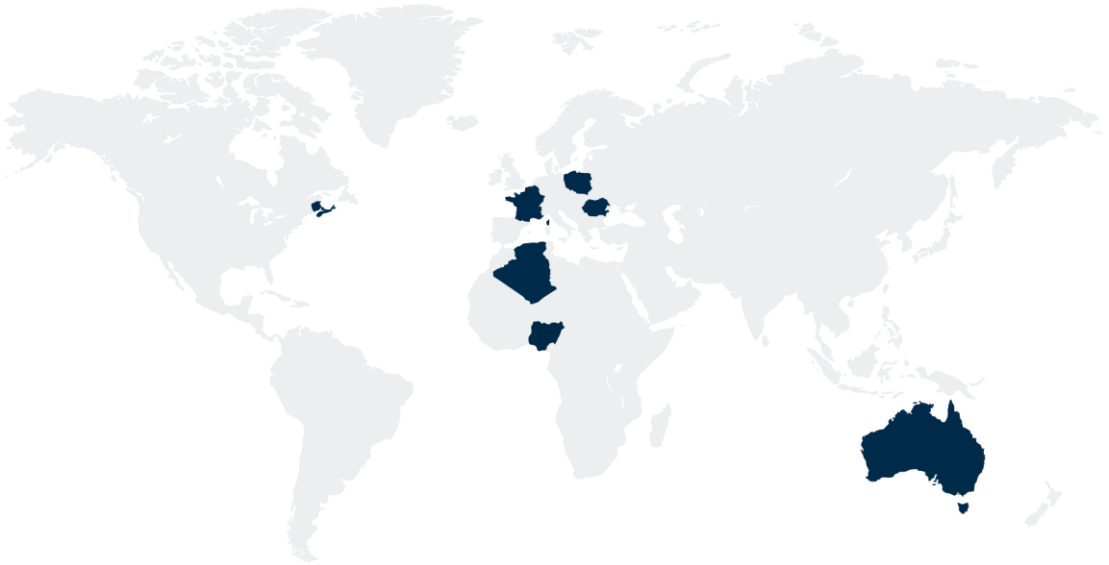
LPMA (France)

Air Liquide (France)

Nearly 60 generators sold since the start of sales (SoS)

A network of dealers worldwide

GEH2®



France, Belgium, Luxembourg, Poland, Romania, Moldavia, Algeria
Eneria - www.eneria.fr

Australia
Blue Diamond - www.bluedm.com.au

Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island)
Aspin Kemp & Associates - www.aka-group.com

Nigeria
Buserve LTD - www.buserveltd.com

EODev

REXH2®

France, Belgium, Luxembourg, Poland, Romania, Moldavia, Algeria
Eneria - www.eneria.fr

United States, Canada
Aspin Kemp & Associates - www.aka-group.com