MARINE ENERGY CONVEYER

AUGUST 2022

Problems

Essential problems for any wind or solar energy conversion project and tech:

INTERMITTENCY and UNPREDICTABILITY!

Why?

LOCATION LOCKED NATURE of conventional wind and solar.

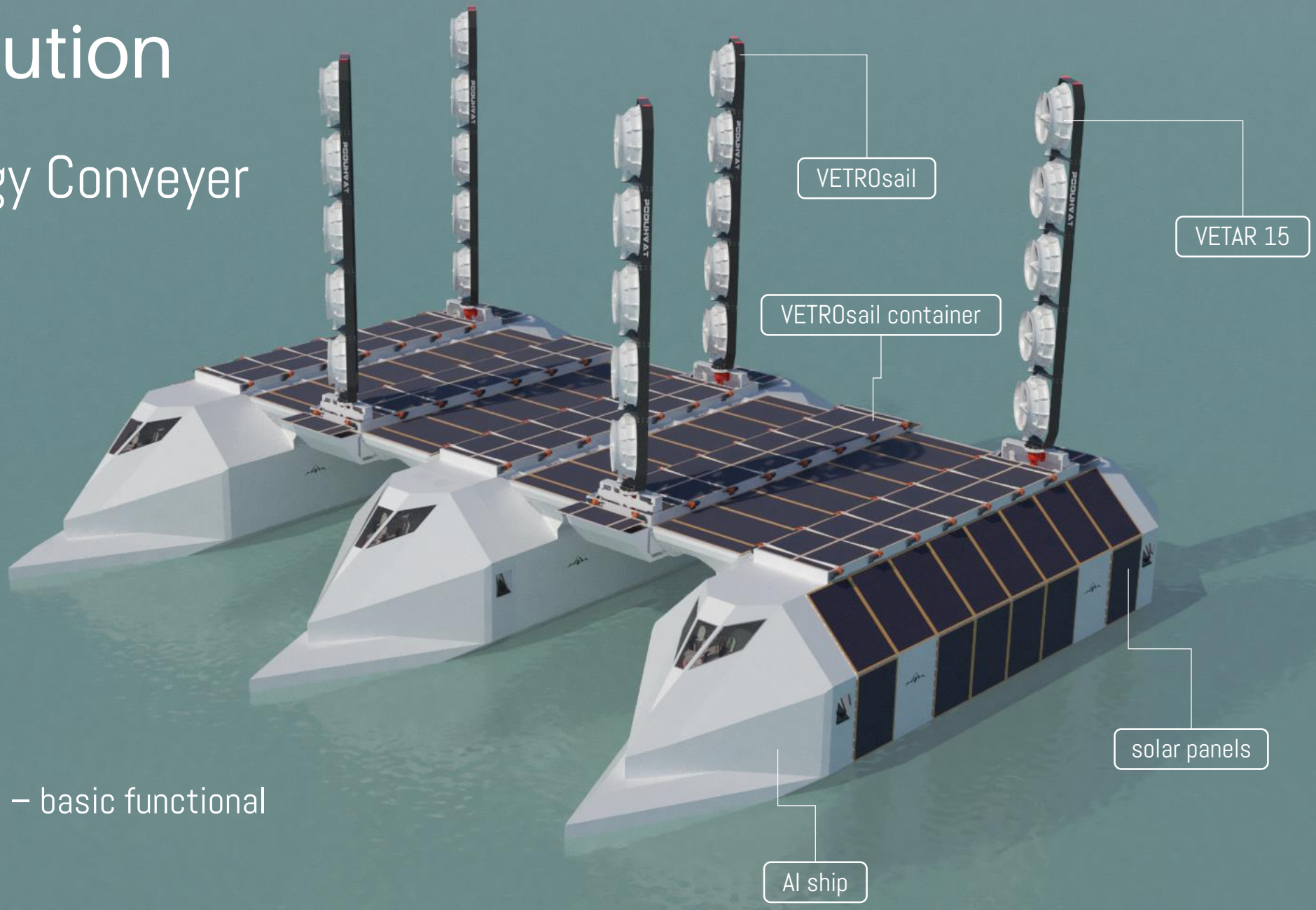
Additional problems:

- Depth limitations
- Elevated costs

Background photo credits: Jesse de Meulenaere

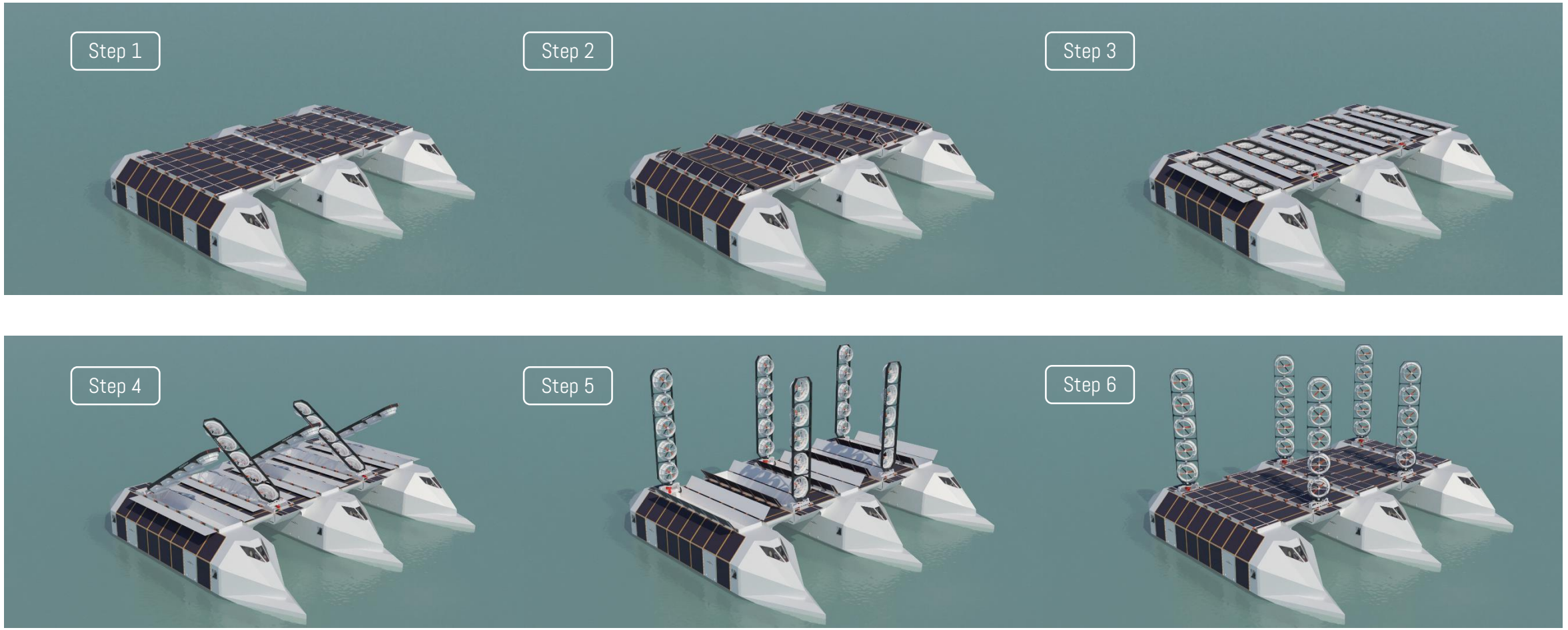
Our solution

Marine Energy Conveyer (MEC)



MEC AI modular ship – basic functional unit of MEC system.

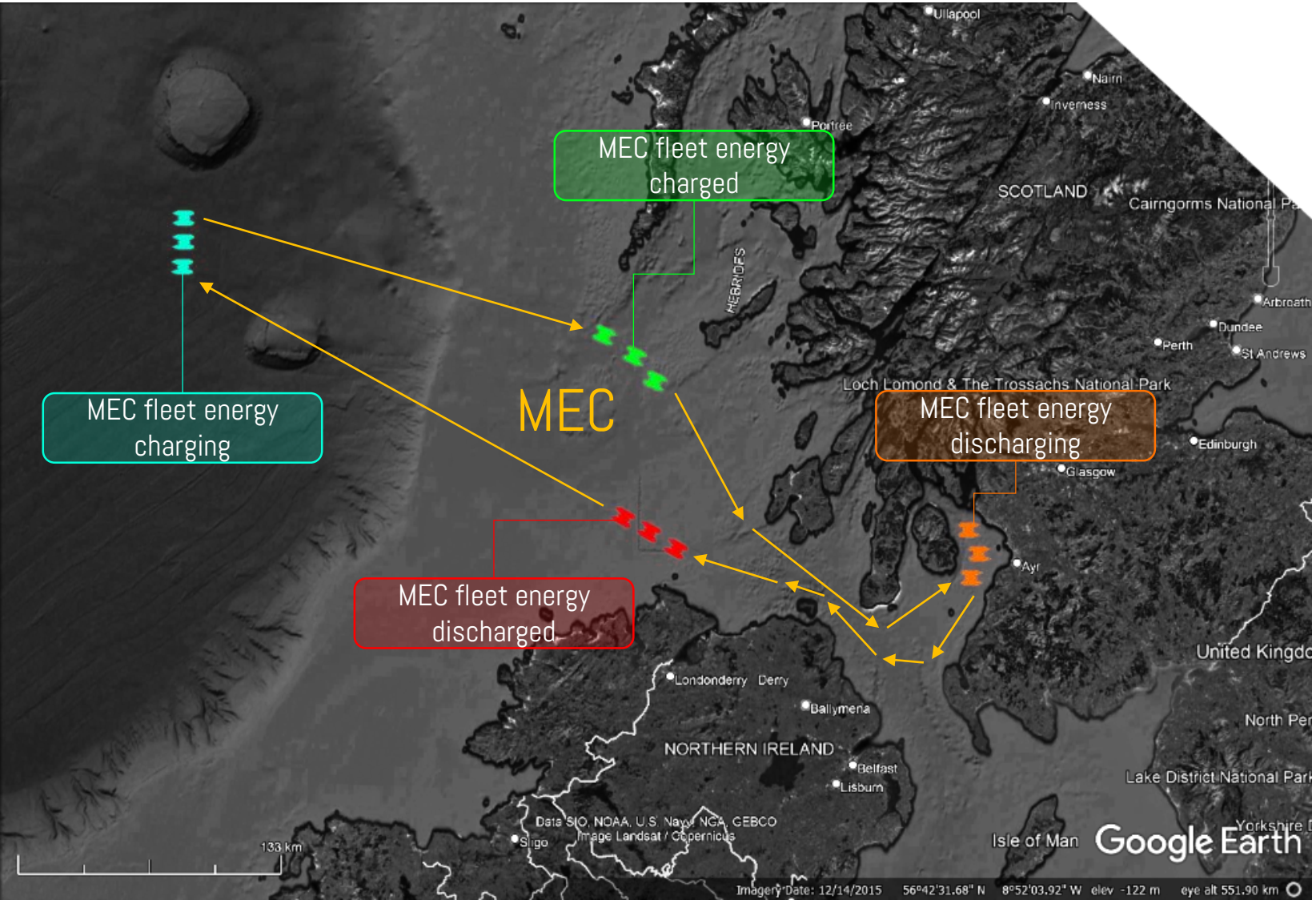
Our solution



Full operational deployment in minutes.

Our solution

How does it works?



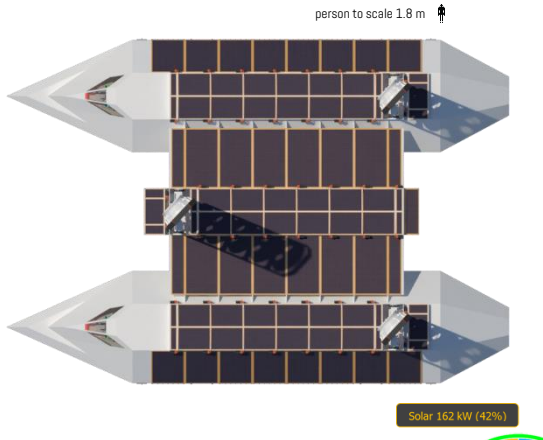
Marine Energy Conveyer (MEC) is a mobile autonomous intelligent system which does not wait for winds but in contrary intercept winds and reduce wind intermittency and unpredictability to minimum.

The most basic MEC system must consist of at least 4 MEC ships, within at least 4 separated MEC fleets. Preferably fleet should have multiple MEC ships, as much more practical and functional option.

As one fleet is charging energy at open oceans, another already fully charged is going toward energy discharging station. In the same time third MEC fleet is already discharging its energy at discharging station while the forth fleet is rushing toward energy charging location.

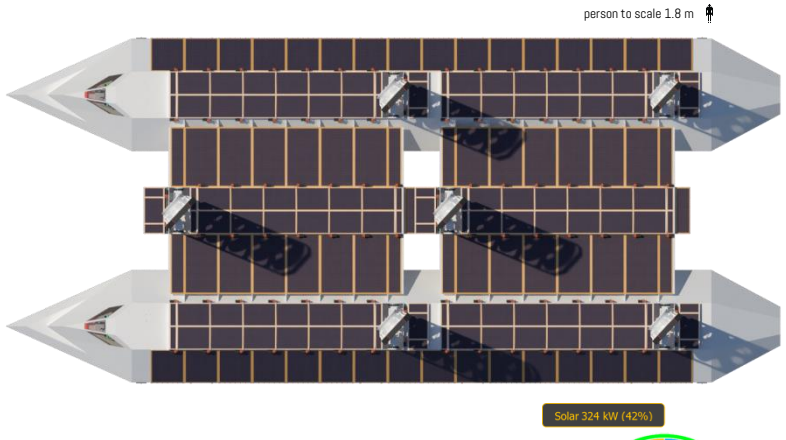
In this way Marine Energy Conveyer is formed that brings converted wind energy where ever that energy is needed.

Our solution



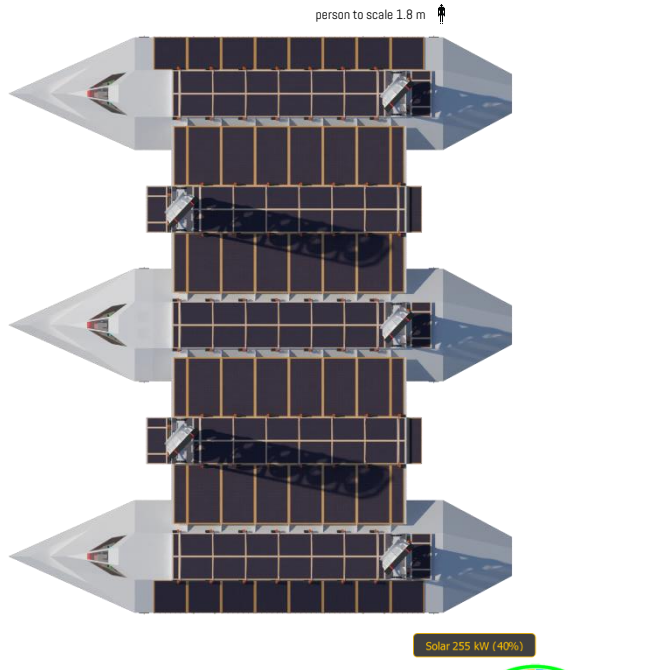
MEC ship basic variant.

- Manned or unmanned operated.
- GPS guided or by preplanned trajectory.
- May be AI equipped.
- Multiple collision avoidance sensors with 360 degrees coverage.
- Real time meteorological data processing and trajectory and positioning adjustments.
- Useful cargo volume at least 7000 cubic meters.
- Battery or hydrogen stored energy.
- Unlimited range, with 300 tons cargo, at 6.3 knots.
- Empty displacement 1013 tons.
- Combined power conversion capacity installed 387 kW (225 kW wind and 162 kW solar)
- Projected annual combined energy production for wind and solar: 1472 MWh (wind at 10 m/s average wind speed with weibull k values of 6 1363 MWh and solar 109 MWh)



MEC ship basic extended variant.

- Manned or unmanned operated.
- GPS guided or by preplanned trajectory.
- May be AI equipped.
- Multiple collision avoidance sensors with 360 degrees coverage.
- Real time meteorological data processing and trajectory and positioning adjustments.
- Useful cargo volume at least 13000 cubic meters.
- Battery or hydrogen stored energy.
- Unlimited range, with 600 tons cargo, at 7.6 knots.
- Empty displacement 1760 tons.
- Combined power conversion capacity installed 774 kW (450 kW wind and 324 kW solar)
- Projected annual combined energy production for wind and solar: 2944 MWh (wind at 10 m/s average wind speed with weibull k values of 6 2725 MWh and solar 219 MWh)

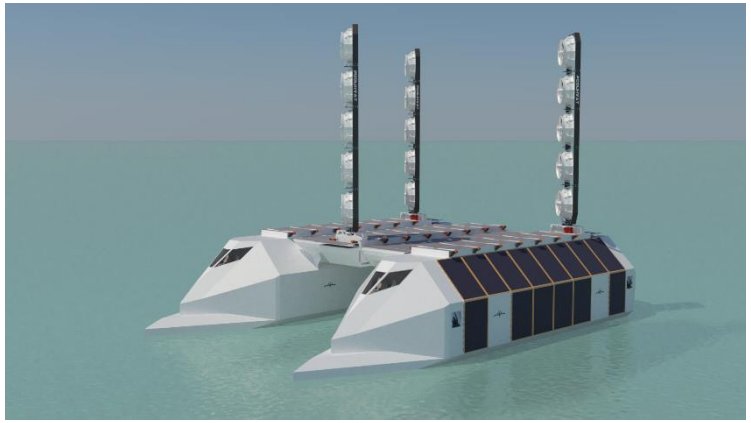


MEC ship basic widened variant.

- Manned or unmanned operated.
- GPS guided or by preplanned trajectory.
- May be AI equipped.
- Multiple collision avoidance sensors with 360 degrees coverage.
- Real time meteorological data processing and trajectory and positioning adjustments.
- Useful cargo volume at least 10500 cubic meters.
- Battery or hydrogen stored energy.
- Unlimited range, with 450 tons cargo, at 6.6 knots.
- Empty displacement 1596 tons.
- Combined power conversion capacity installed 630 kW (375 kW wind and 255 kW solar)
- Projected annual combined energy production for wind and solar: 2444 MWh (wind at 10 m/s average wind speed with weibull k values of 6 2271 MWh and solar 173 MWh)

Our solution - economics

MEC ship basic variant

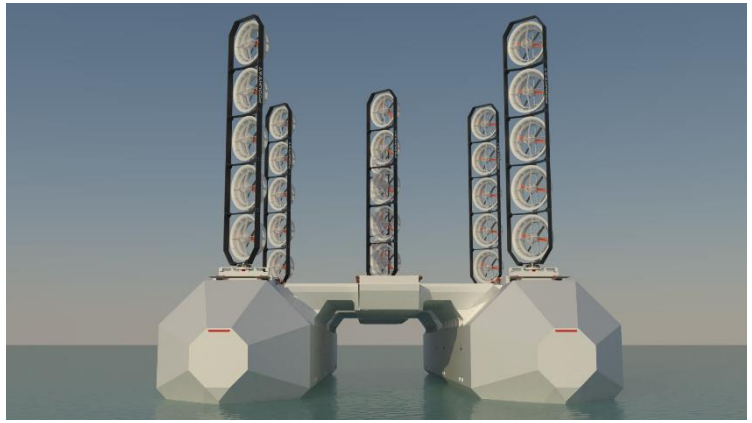


SHIP PRICE WITH 9 MWH of battery storage:
€1.836418

LEVELIZED COSTS (LCOE) per [MWh] with one human operator on board: **€86**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **4,1**
PROFIT for 20 years time period: **€9.826.376**

LEVELIZED COSTS (LCOE) per [MWh] without human operator on board (fully automatic): **€64**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **3**
PROFIT for 20 years time period: **€10483496**

MEC ship basic extended variant

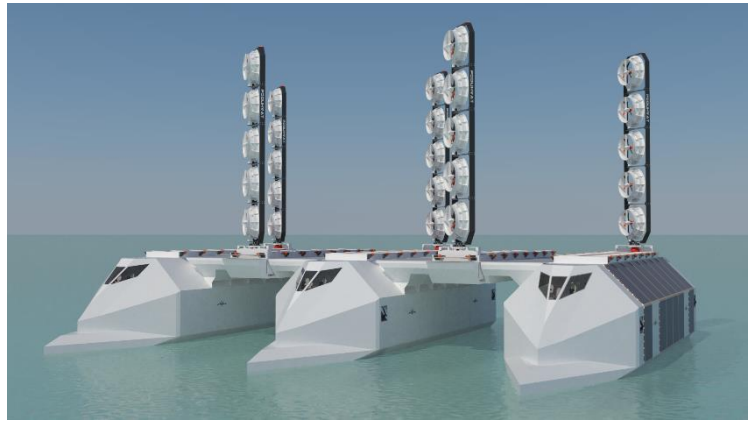


SHIP PRICE WITH 17 MWH of battery storage:
€3.268.003

LEVELIZED COSTS (LCOE) per [MWh] with one human operator on board: **€68**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **3,2**
PROFIT for 20 years time period: **€20.719.164**

LEVELIZED COSTS (LCOE) per [MWh] without human operator on board (fully automatic): **€57**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **2,7**
PROFIT for 20 years time period: **€21.376.285**

MEC ship basic widened variant



SHIP PRICE WITH 13 MWH of battery storage:
€2.610.882

LEVELIZED COSTS (LCOE) per [MWh] with one human operator on board: **€68**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **3,2**
PROFIT for 20 years time period: **€17.188.004**

LEVELIZED COSTS (LCOE) per [MWh] without human operator on board (fully automatic): **€55**
BREAK EVEN TIME IN YEARS (with selling price of €300 per MWh): **2,6**
PROFIT for 20 years time period: **€17.845.125**

Note: Prices and calculations presented here may be subject to changes due to exchange rate changes in vivo testing and possible technical modification changes.

Options - Electricity, Green H_2 and Drinking Water

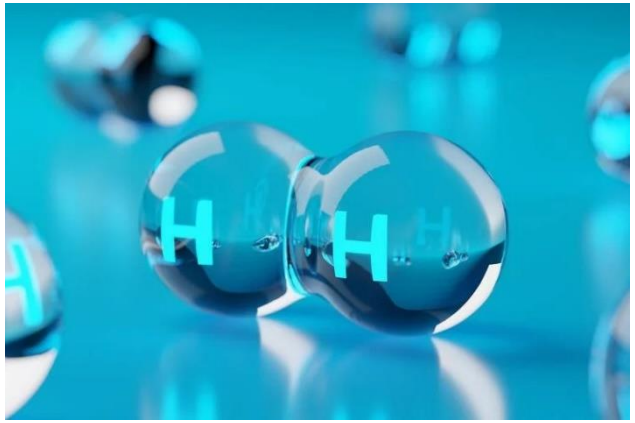
Exemplary Case for MEC basic ship - widened variant (wind at 10 m/s average wind speed with Weibull k values of 6)

MEC - Electricity production

In this variant MEC ships are equipped to produce, store and deliver electric energy.
Currently this is the most efficient variant.

Projected annual combined energy production for wind and solar: 2444 MWh
(2271 MWh wind and solar 173 MWh)

LEVELIZED COSTS (LCOE) per [MWh] with human operator on board: €68
Option when fully automatic: €55



MEC - Green Hydrogen production

In this variant MEC ships are equipped to produce, store and deliver green hydrogen.

Projected annual combined energy production for wind and solar: 2444 MWh
(2271 MWh wind and solar 173 MWh)

LEVELIZED COSTS (LCOE) per [1kg] of hydrogen with human operator on board: €243
Option when fully automatic: €1.96

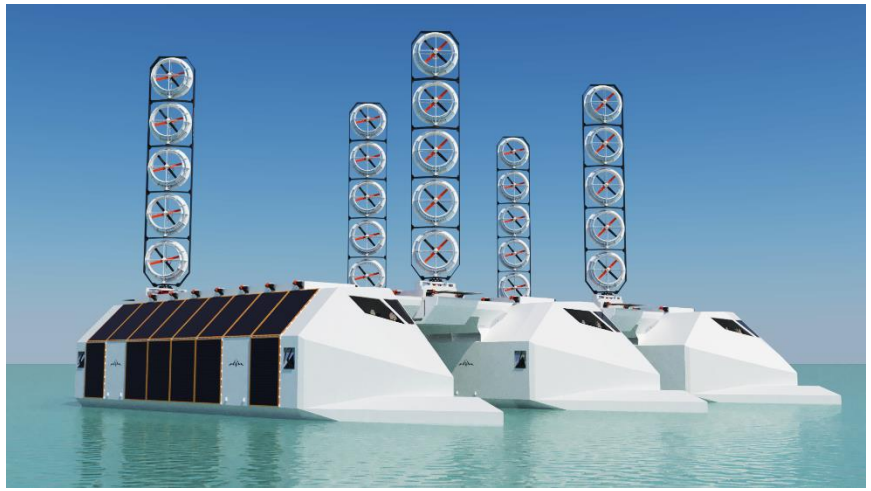
MEC - Water production

In this variant MEC ships are equipped to produce, and store drinking water.
Currently this is the most profitable variant.

Projected annual combined energy production for wind and solar: 2444 MWh
(2271 MWh wind and solar 173 MWh)

LEVELIZED COSTS of WATER (LCOW) per [1m^3] of water with human operator on board: €0.28
Option when fully automatic: €0.23

Our solution vs offshore regular wind turbines (ORWTs)



VS

- LCOE may go below €50 per MWh.
- Implementation depth unlimited.
- Location free – highly unsusceptible to wind intermittence.
- Low impact on local climate.
- No landscape destruction and negative tourism effects.
- No radars shadowing.
- No high intensity infrasound emissions negative effects on marine fauna.
- Possibility of additional applications – water production and storage, hydrogen production and storage, transport, security activities.

- LCOE cannot go below €200 per MWh.
- Implementation depth cannot breach 50 meters (for floating ORWTs theoretically depth can reach 1000 m but this drastically increase operational costs which is why floating ORWTs are not mass used).
- Location locked – highly susceptible to wind intermittence.
- Significant impact on local climate.
- Landscape destruction and negative tourism effects.
- Radars shadowing.
- High intensity infrasound emissions negative effects on marine fauna.

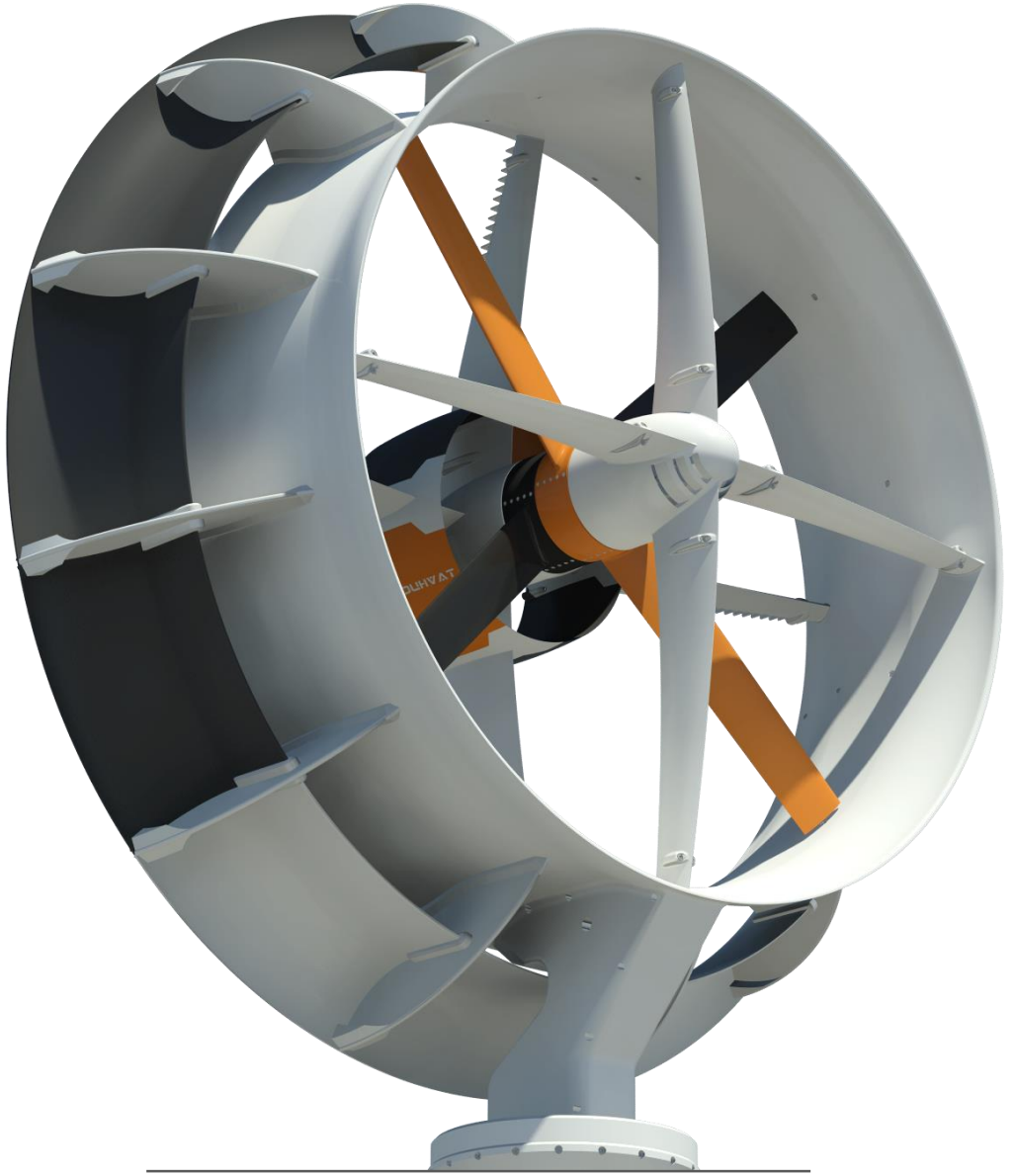
Our solution foundation

MEC system is impossible without implementation of our proprietary VETAR wind turbines technologies.

Why?

VETAR wind turbines (VWT) are much smaller in size than regular wind turbines (RWTs) of same power.
As such they are much more applicable as they provide much higher energy conversion density which is critical for limited space application, like at ships for example.

Due to larger size for corresponding power output, vibrations and their top heavy nature, RWTs practical application within MEC is impossible.



VETAR wind turbine.

Recognitions

SOLAR IMPULSE
EFFICIENT SOLUTION LABEL

This certifies that

VETER

by

Poduhvat

was attributed the Solar Impulse Efficient Solution Label following an assessment performed by external independent experts and based on verified standards.

Aug 2021

SOLARIMPULSE FOUNDATION

Bertrand Piccard
Chairman of the Solar Impulse Foundation

Recognitions

Climate Smart Urban
Developement Challenge

BEST IDEA AWARD
to
Predrag Paunovic
in front of
PODUHVAT

handed over by

Minister of Enviroment and Protection
Mr. Goran Trivan
and
Deputy Resident Representative UNDP
Ms. Steliana Nedera

BELGRADE
SERBIA
2018

Predrag Paunovic
cofounder
Poduhvat

Nenad Paunovic
cofounder
Poduhvat

As a ...
2016
WINNER
of

NEW ENERGY
GLOBAL STARTUP FEST

BE A HERO TOO

Thanking note

Nenad Paunovic

by

Minister of Innovation and Technological Development,

Mr.Nenad Popovic

Autodesk Clean Tech Partner

BkVF
BALKAN VENTURE FORUM
BELGRADE | SERBIA | 22 & 23 NOVEMBER 2012

Winner 2012

OPEN INNOVATIONS
Forum and Technology Show

Special Guest 2013

Winner 2016

CLIMATE SMART URBAN
DEVELOPMENT
CHALLENGE

Winner 2018

SOLAR IMPULSE
LABEL
EFFICIENT SOLUTION

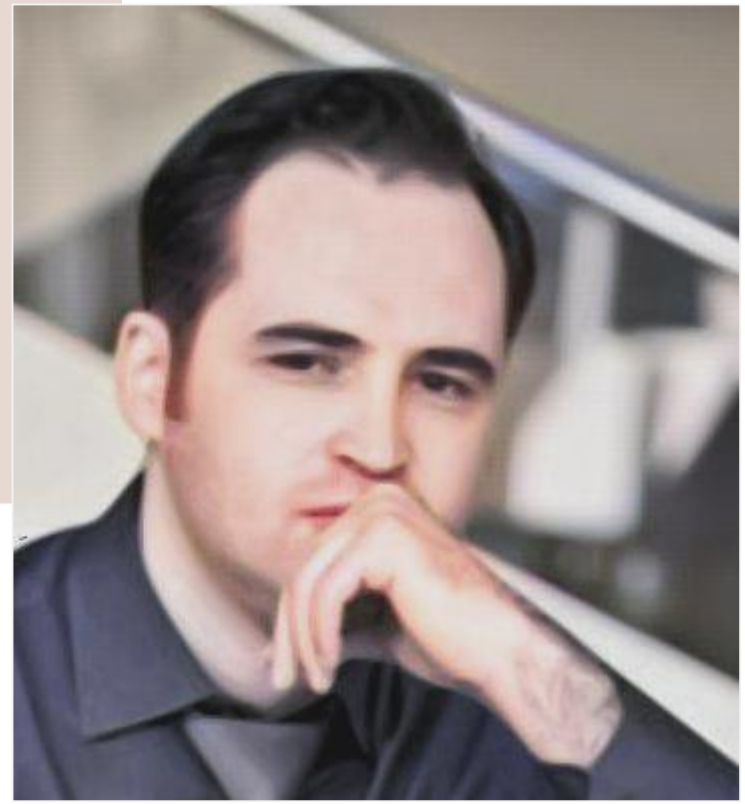
T E A M

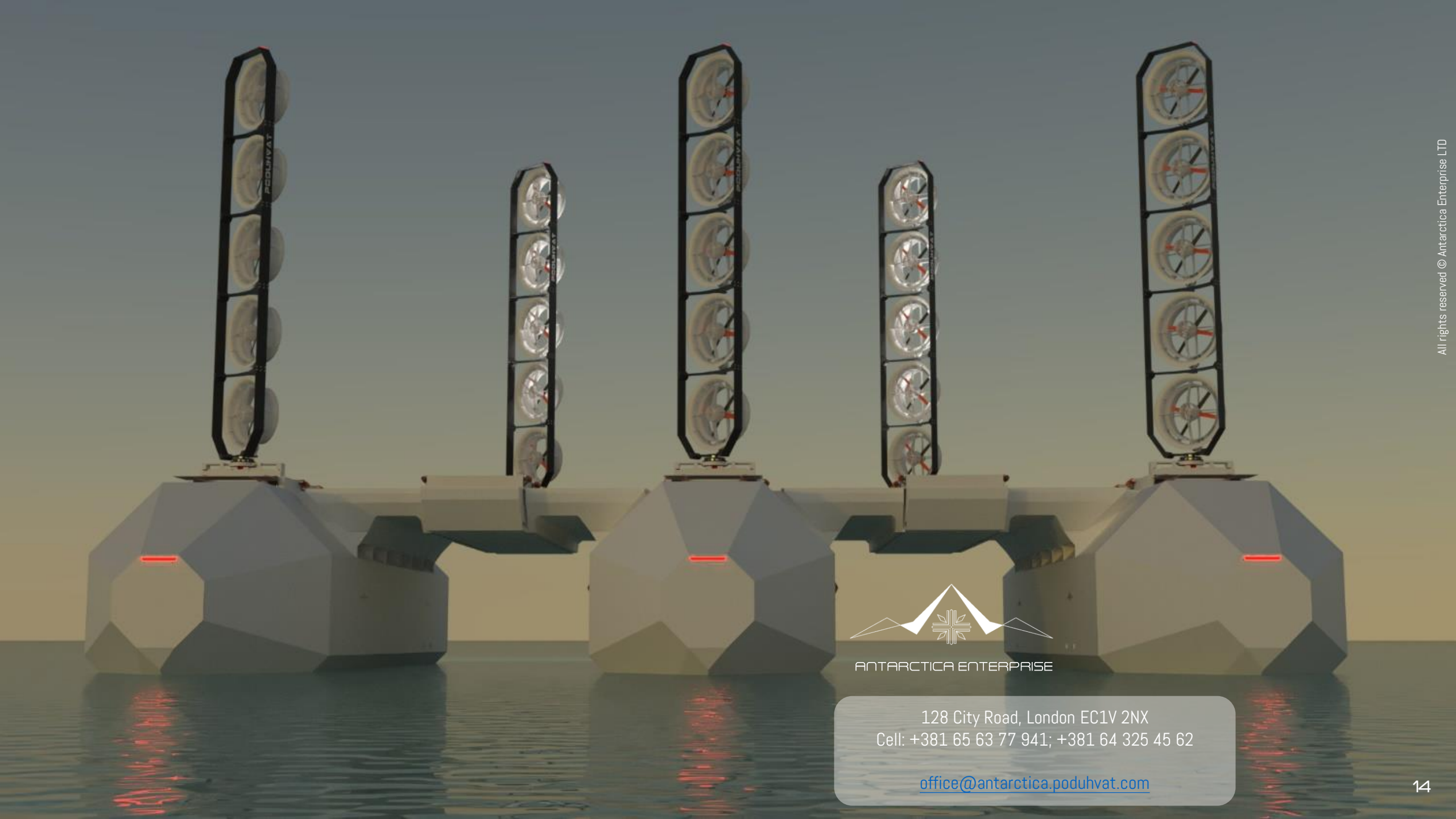
Nenad is cofounder of Poduhvat as well as Antarctica Enterprise.

Working on our RE projects since 2006 as main designer, developer and engineer. Together with Predrag, Nenad is a holder of 13 international patents.

Predrag is cofounder of Poduhvat and Antarctica Enterprise.

He is a consulting expert with working experience of more than 10 years. His area of expertise is innovation, marketing, investment. Together with Nenad he is a holder of 13 international patents and several international awards.





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