

HYCata-Hope

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MAIN DIMENSIONS OF THE VESSEL

LOA: 21,57 [m]

Breadth: 9,89 [m]

Depth: 5,487 [m]

Displacement: 148,8 [t]

Draft: 1,879 [m]

Cruising Speed: 12 [knot]

Wet Area: 210,684 [m²]

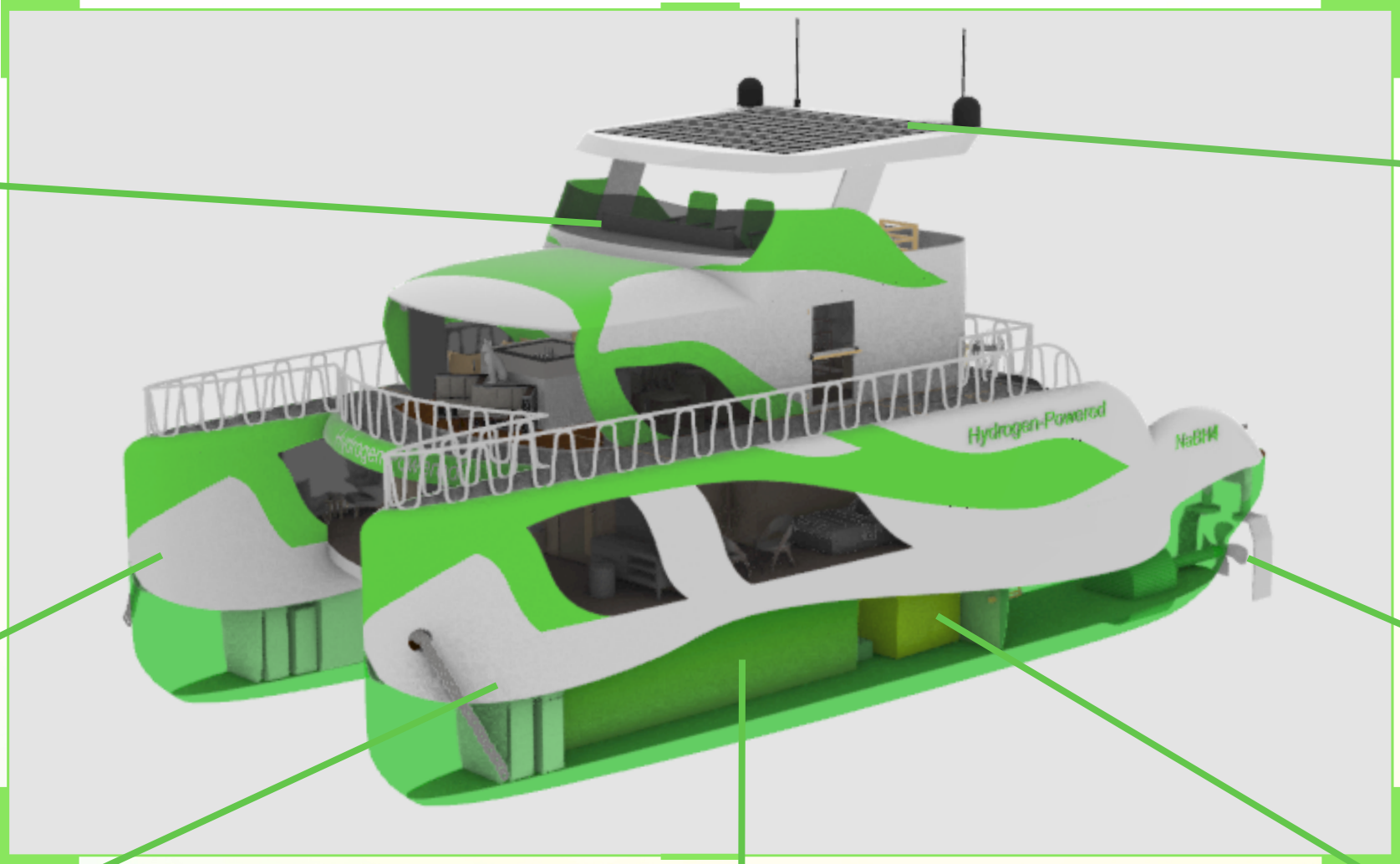




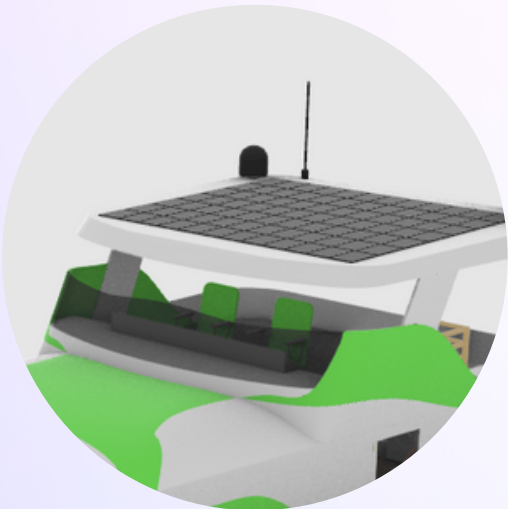
Intended Use

- HYCata-Hope is a zero-emission catamaran cruising boat using Sodium Boron Hydride as fuel.
- It aims to reduce pollution from fossil fuels and protect life.
- Waste wind turbine blades will be used in the construction of the boat. It is to offer an alternative way to utilize blades that have the potential to generate high amounts of waste.
- With its innovative steering system Gate Rudder, it has the advantage of fuel savings and faster maneuvering.

INNOVATIVE FEATURES

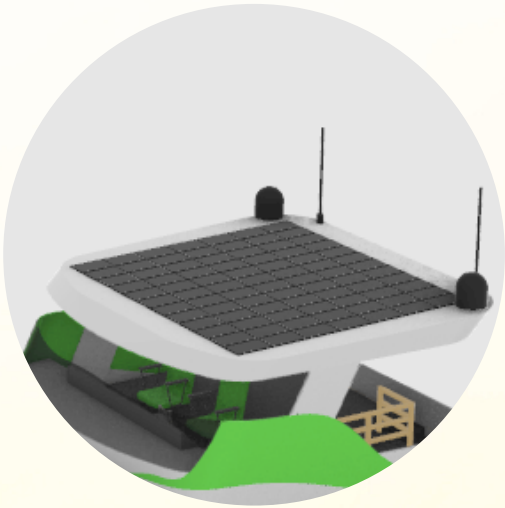


PMS ve Digital Twin



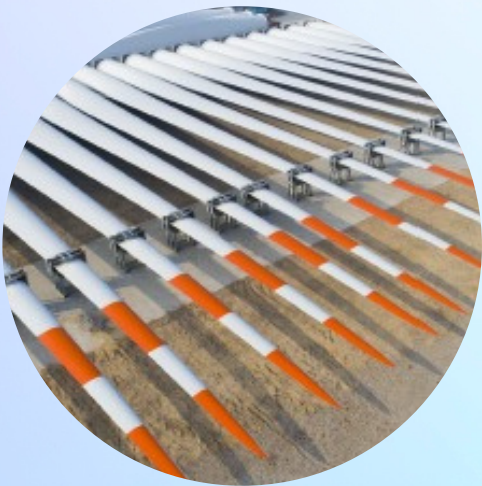
Power and Control Management System

Solar Panel



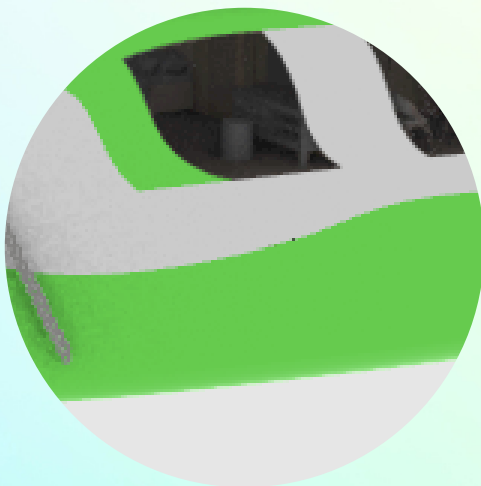
Auxiliary Power Supply

Waste Wind Turbine Blade



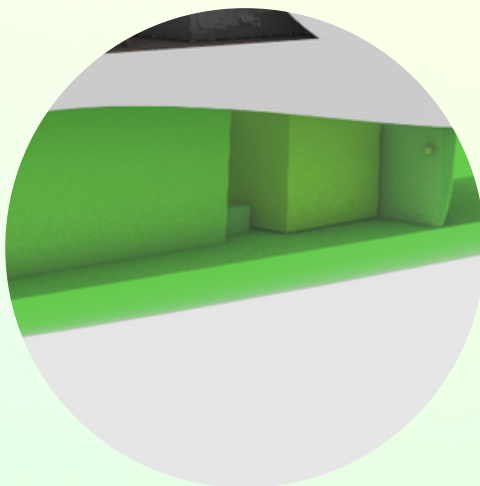
Production Material

Liquid glass



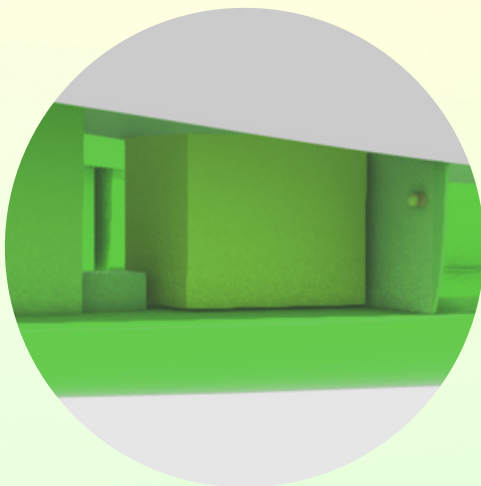
Underwater Coating

Sodium Boron Hydride



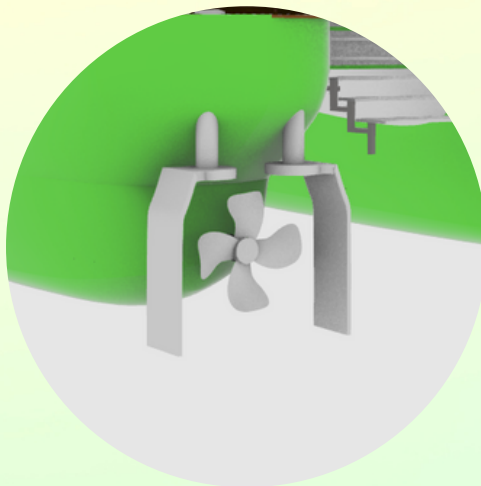
Main Power Supply

BMS

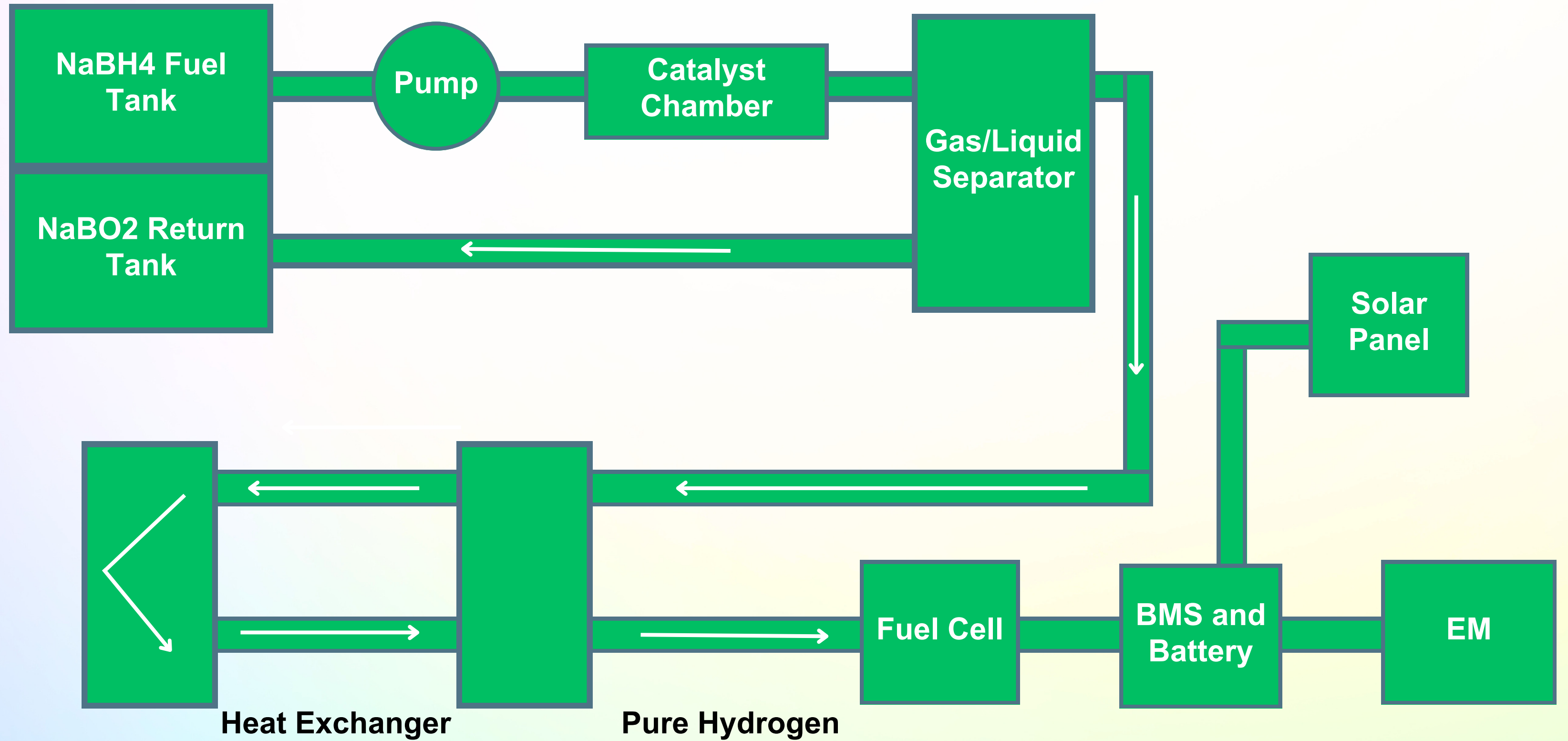


Power and Control Management System

Gate Rudder



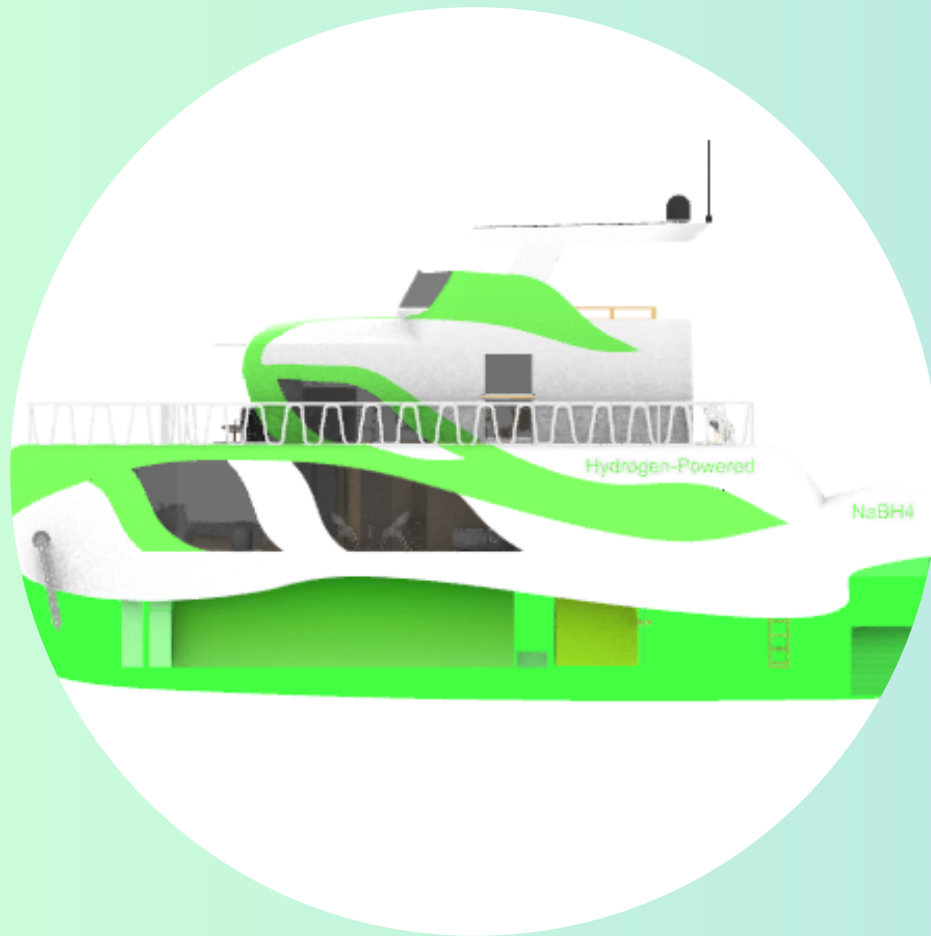
Rudder System



Şekil 1. HYCata-Hope Power Generation System (Bilici, 2004)

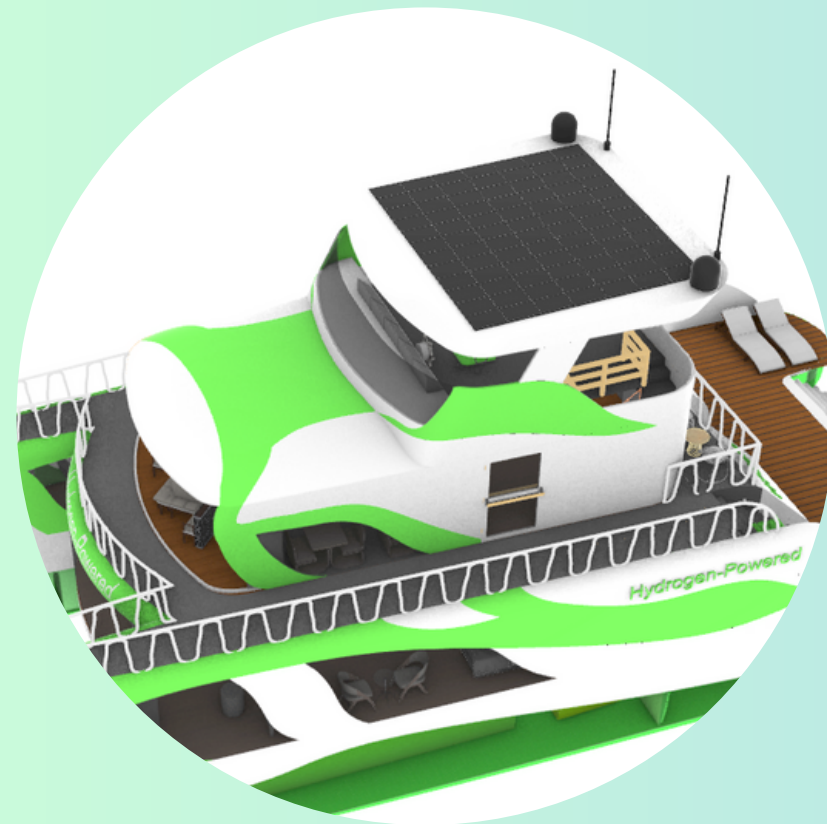
POWER GENERATION SYSTEM

- It is aimed to send the hydrogen resulting from the reaction of NaBH_4 with water to a fuel cell and generate electricity from there (Shakeri et al., 2020).

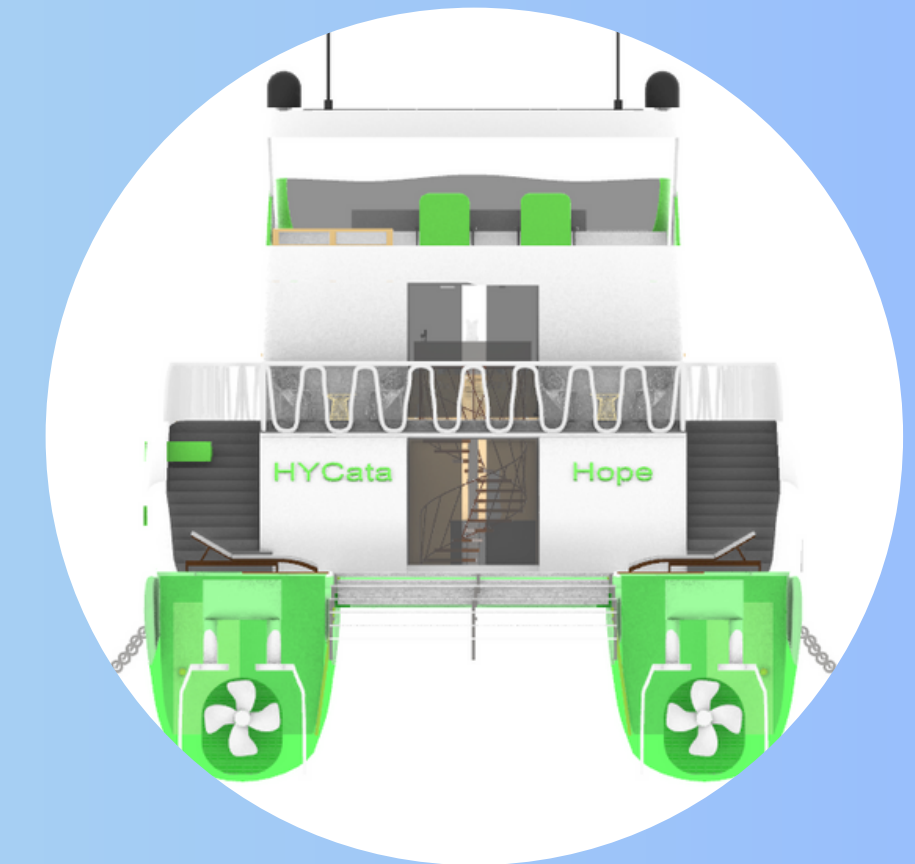


- A catalyst is used to accelerate the reaction.
- The hydrogen formed after the reaction has moisture. A heat exchanger is used to remove this moisture

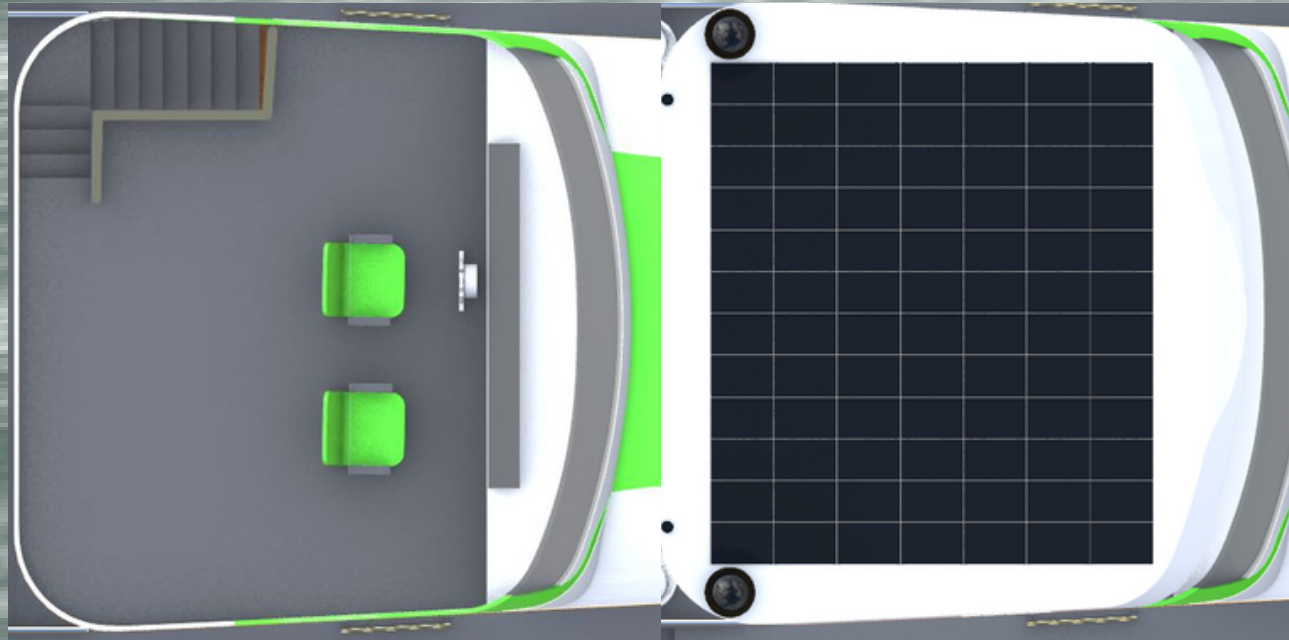




- Pure Hydrogen from the heat exchanger is sent to the fuel cell to generate electricity.
- The generated electricity is stored in the battery.
- At the same time, additional power from solar panels is stored in the battery.
- The entire battery and electrical system are controlled by BMS.



- A proton exchange membrane (PEM) fuel cell was selected for use in HYCata-Hope. Two fuel cells of 130 kW per boat, total of 4 PEM fuel cells were selected.



Bridge Deck: Covered with solar panels for additional power needs.



2nd deck: Kitchen, bar, dining table and seating areas.



Deck 1: The main deck is reserved for cabins.



Engine Room: There are 2 Sodium Boron Hydride fuel tanks on board.

STABILITY

Intact State

Drafts at equilibrium angle

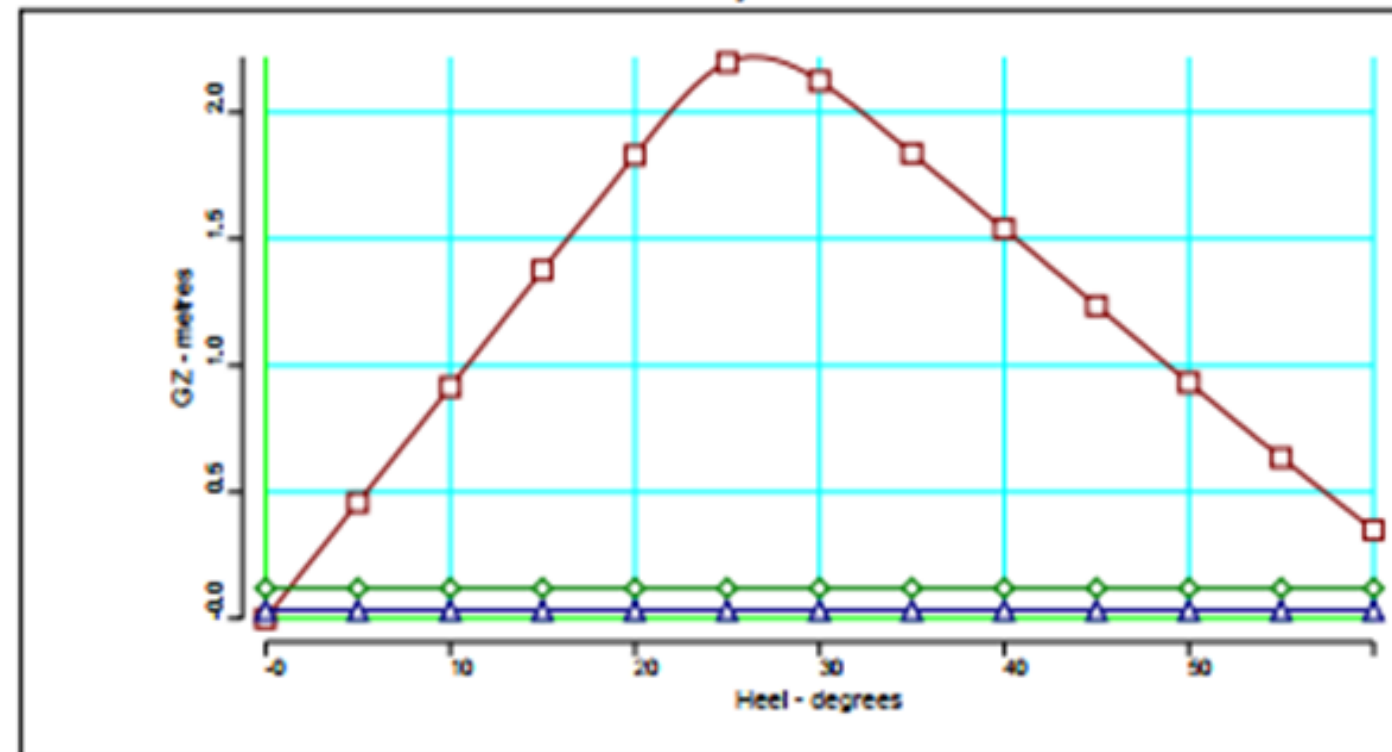
Draft at AP	1.881	metres
Draft at FP	1.877	metres
Mean draft at midships	1.879	metres

Hydrostatics at equilibrium angle

Density of water	1.0250	tonnes/cu.m
Heel	No heel	
Trim by the stern	0.003	metres
KG	3.787	metres
FSC	0.048	metres
KGf	3.835	metres
GMt	5.244	metres
BMt	8.065	metres
BMI	20.285	metres
Waterplane area	91.87	sq.metres
LCG	9.582	metres
LCB	9.582	metres
TCB	-0.000	metres
LCF	9.414	metres
TCF	0.000	metres
TPC	0.942	tonnes/cm
MTC	1.400	tonnes-m/cm

Intact State

Tam Yüklü Kondisyon: Intact State



Righting Lever (GZ) Curve

Heel to Stbd (deg)	GZ (m)	Crowding (m)	Turning (m)
0.00	-0.0000	0.0332	0.1202
5.00	0.4581	0.0332	0.1202
10.00	0.9146	0.0332	0.1202
15.00	1.3754	0.0332	0.1202
20.00	1.8295	0.0332	0.1202
25.00	2.1964	0.0332	0.1202
30.00	2.1232	0.0332	0.1202
35.00	1.8371	0.0332	0.1202
40.00	1.5390	0.0332	0.1202
45.00	1.2353	0.0332	0.1202
50.00	0.9318	0.0332	0.1202
55.00	0.6357	0.0332	0.1202
60.00	0.3500	0.0332	0.1202

IMO Turning

Property	Value	Units
Area A	1.21182	m-radians
Total Area A+B	1.33628	m-radians
Steady state angle	1.311	degrees
Max. angle	60.000	degrees

IMO Passenger crowding

Property	Value	Units
Area A	1.30158	m-radians
Total Area A+B	1.33628	m-radians
Steady state angle	0.363	degrees
Max. angle	60.000	degrees

REFERENCES

Bilici, U. (2004, September 23-25). Sodium borhydride production methods [Symposium] 2. International Boron Symposium, Eskisehir, Turkey. ResearchGate. July 20, 2023

https://www.researchgate.net/profile/Ugur-Bilici/publication/242615079_Sodyum_Borhidrur_Uretim_Yontemleri_Sodium_Borohydride_Production_Methods/links/5b976adf4585153a53290218/Sodyum-Borhidruer-Uretim-Yoentemleri-Sodium-Borohydride-Production-Methods.pdf

İzmir Kalkınma Ajansı. T.C. Sanayi ve Teknoloji Bakanlığı iş birliğiyle yayınlanan İzmir'de Rüzgâr Türbini Geri Dönüşüm Yol Haritası, İzmir, Türkiye. 21 Temmuz 2023 tarihinde <http://www.ruzgarsempozyumu.org/wp-content/uploads/2021/09/sunum6-3.pdf>

Shakeri, N., Zadeh, M. ve Nielsen, J.B. (2020). Hydrogen fuel cells for ship electric propulsion. IEE Electrification Magazine, 8(2), 27-43. IEEE Xplore. 20 Temmuz 2023 tarihinde <https://doi.org/10.1109/MELE.2020.2985484>