



HYDROGEN POWER SOLUTIONS

ENABLING ZERO EMISSION VESSELS



About Genevos

Marine hydrogen power solutions



MISSION

Pioneering plug & play marine hydrogen power solutions to enable clean and resilient mobility on our oceans.

HERITAGE

Genevos was founded in 2018 as a spin-off company from 'OceansLab – Cleantech Accelerator', a record-breaking zero-emission offshore sailing project that innovates and demonstrates low-carbon technologies in the maritime sector.

ACTIVITY

Genevos engineers, certifies and produces plug-and-play Hydrogen Power Modules (HPM) offering scalable power solutions up to multi-MW scale.

Genevos goes further to support the energy transition for clients through the provision of engineering services and energy optimisation through an advanced power management system.



Hydrogen Power Module 'HPM'



The modular fuel cell solution for clean maritime

Decarbonising vessels through auxiliary, primary or hybrid integration

This scalable solution can be applied across the maritime sector from small to large vessels including yachts, ferries, service vessels, inland transport and shipping. In addition to offshore platforms for onboard power generation.

FEATURES

- **Zero emissions** no vibration and low noise
- **High efficiency** fuel cell technology
- **Stackable** to high power
- **Modular** enabling high redundancy
- **Marinised** against humidity & salinity
- **Durable** resistant graphite plate technology
- **Certified** for use on commercial vessels
- **Plug & play** fully integrated balance of plant
- **Power Management** fully integrated



electric
& hybrid marine
AWARDS 2023

electric
& hybrid marine
AWARDS 2022

MONACO
HYDROGEN
ALLIANCE



Fully-Integrated Fuel Cell Solution

Genevos' plug & play marine power solution

SIMPLE INTERFACING



INTEGRATED SYSTEMS

- Durable graphite PEM fuel cell stack
- Air filtration and compression
- Cooling system with heat exchanger
- DC-DC converter
- Energy Management System
- Safety monitoring system
- User interface & data logger



HPM Benefits

Accelerating the clean power transition

ADVANCED

- Marine resistant and proven graphite stack technology
- Marinised - resistant to saline environment

EFFICIENT

- Up to 55% net fuel efficiency - twice that of a diesel genset
- Advanced energy management optimising fuel efficiency
- 4 – 6 times lighter than batteries

ENVIRONMENTAL

- Zero emissions: No CO₂, NO_x or SO_x
- No vibration, low noise
- High recyclability (>90%)

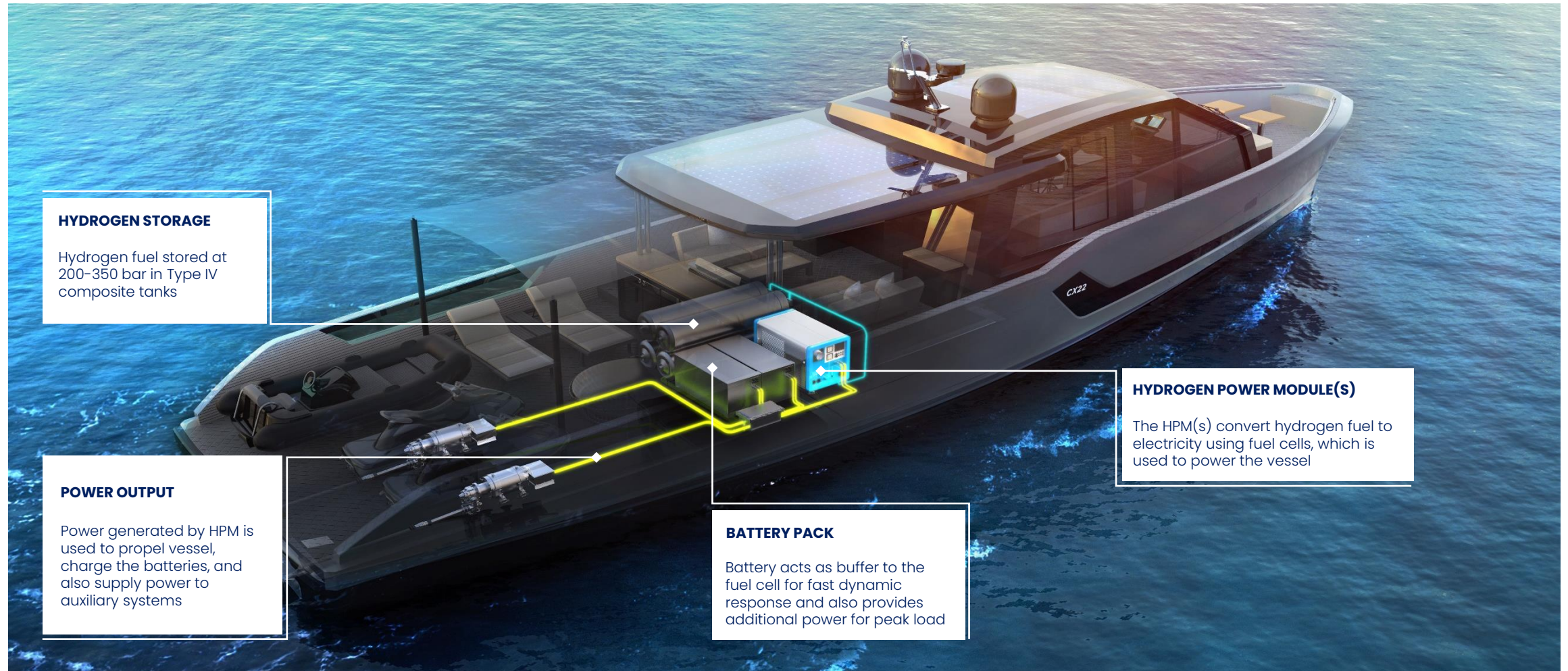
PRACTICAL 'PLUG-AND-PLAY'

- Rapid refuelling
- Low maintenance
- Modular - multiple units to attain required power
- Fully integrated system for practical installation



Hydrogen-Electric System

Providing a low weight, zero emission propulsion solution for vessels



HYDROGEN STORAGE

Hydrogen fuel stored at 200-350 bar in Type IV composite tanks

POWER OUTPUT

Power generated by HPM is used to propel vessel, charge the batteries, and also supply power to auxiliary systems

HYDROGEN POWER MODULE(S)

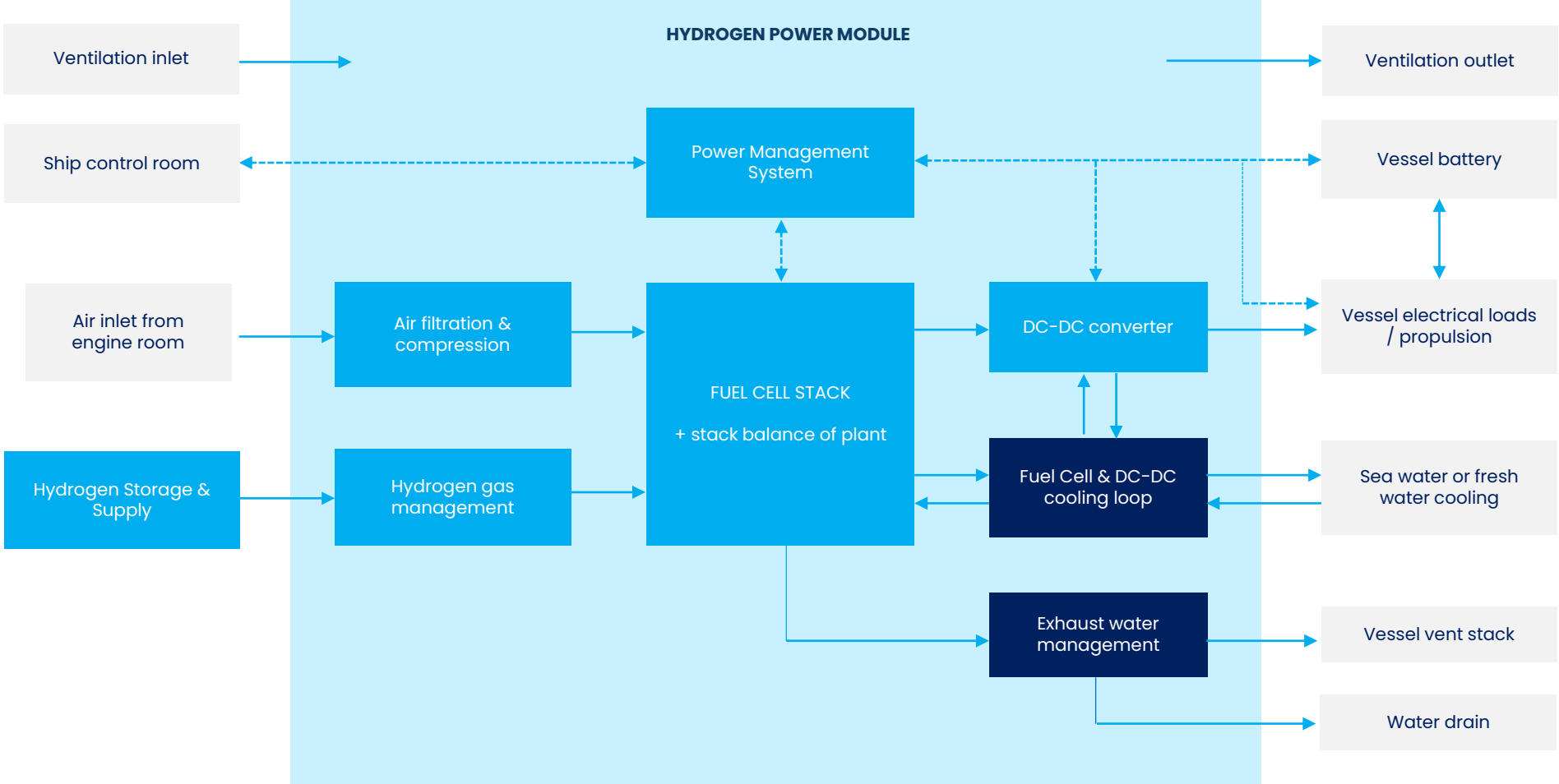
The HPM(s) convert hydrogen fuel to electricity using fuel cells, which is used to power the vessel

BATTERY PACK

Battery acts as buffer to the fuel cell for fast dynamic response and also provides additional power for peak load

HPM – Scope of Supply

The drop-in solution



Scalable Power Solutions

Modularity to enable tailored power systems

HPM FAMILY

Genevos offer a broad solution that can be applied across the maritime sector based on three scalable modules with EOL rated powers of 40 kW, 80 kW and 250 kW.

This modularity meets customised power requirements for a wide range of vessels and stationary applications, whilst benefiting from increased energy security.

The marinised modules can be installed in an engine room or containerized for deck installation.



HIGH POWER SYSTEMS

The 250 kW (launch date Q2 2024) provides a highly practical solution for achieving multi-MW power systems.

- Fully-integrated, independent modules for high redundancy
- Optimised durability, through advanced system control
- Optimised fuel cell efficiency, through advanced system control

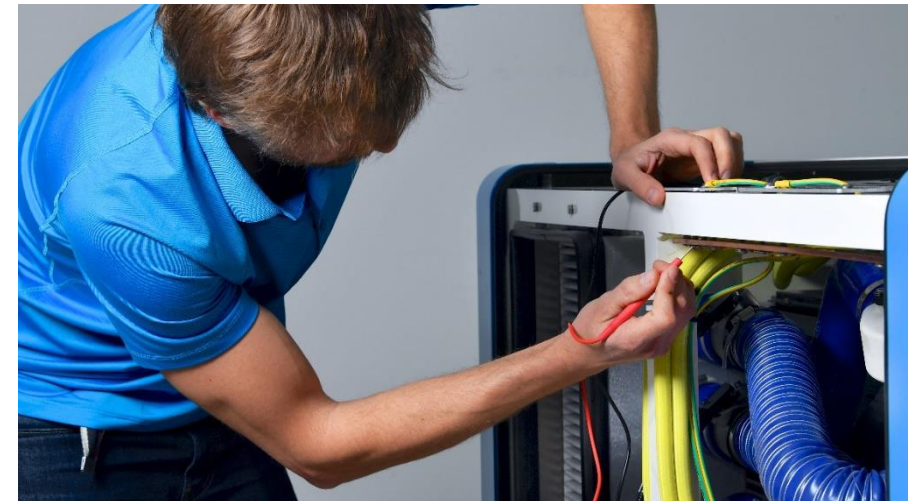


HPM Technical Specifications

A compact and low weight solution designed for vessels



| TECHNICAL DATA | HPM-40 Gen II | HPM-80 Gen II | HPM-250 Gen II |
|-----------------------------------|-----------------------------|---------------------------|---------------------------|
| Continuous Peak Power (BOL) | 50 kW | 100 kW | 280 kW |
| Rated Power (EOL) | 35 kW | 80 kW | 240 kW |
| Output Voltage (Controllable) | 300 - 950 V _{dc} | 600 - 950 V _{dc} | 700 - 950 V _{dc} |
| Weight | 250 kg | 450 kg | 930 kg |
| Peak Efficiency | 54 % | 54 % | 52 % |
| Dimensions (L x W x H) | 140 x 80 x 55 cm | 140 x 80 x 85 cm | 160 x 80 x 160 cm |
| Communication | CAN bus | | |
| FC Stack Estimated Lifetime | > 20,000 hrs | | |
| Fuel | Gaseous Hydrogen ISO14687-2 | | |
| Ambient Air Temperature Operation | -25 to 45°C | | |
| Environmental Rating | IP54 (56 option) | | |



Lower Power Applications

Small-medium power vessels applications: 50 kW - 500 kW propulsion

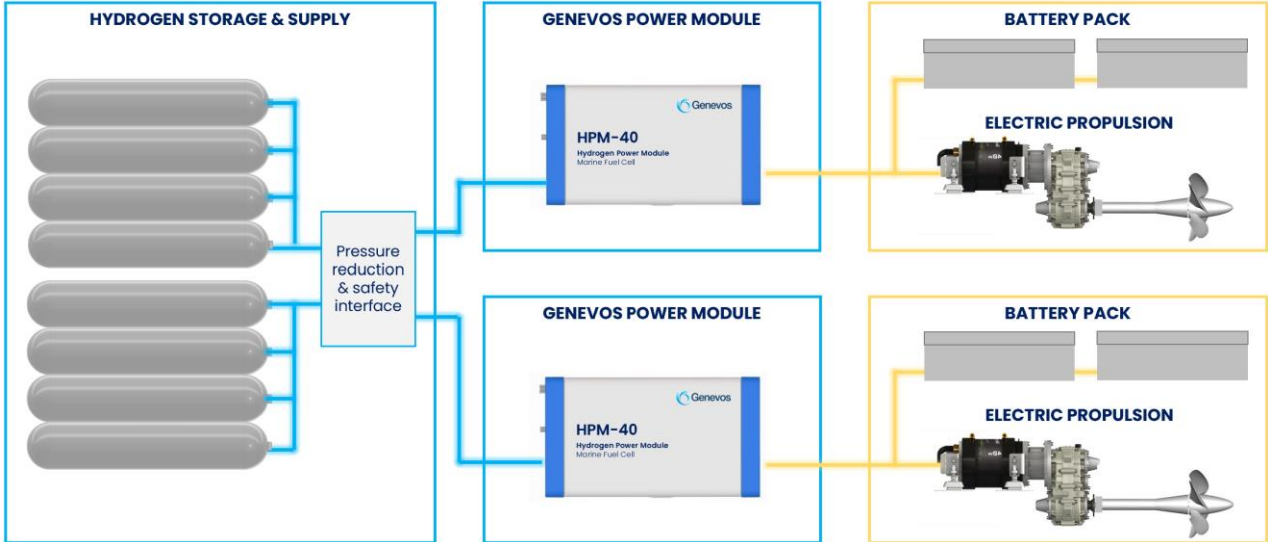
HPM-40



HPM-80



LOW POWER SYSTEM



VESSEL EXAMPLES

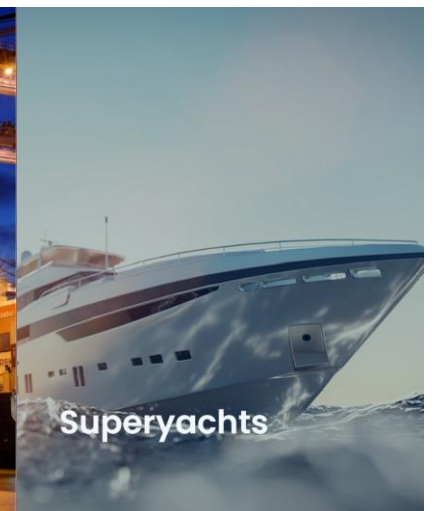
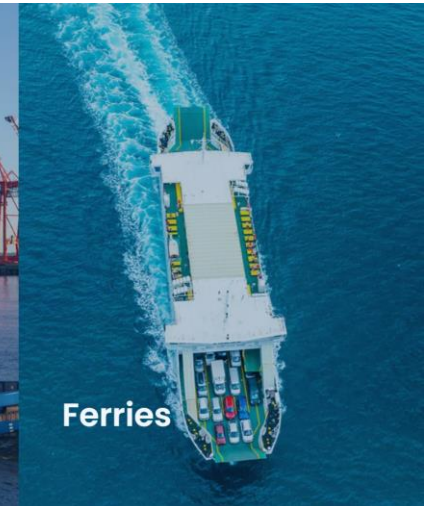
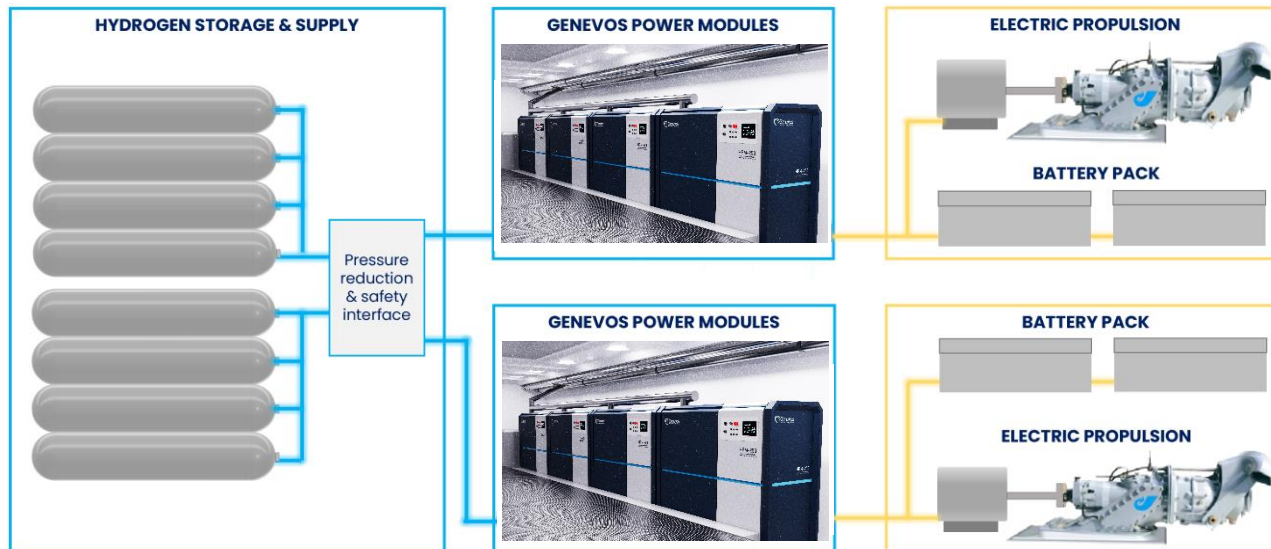
High Power Applications

High power vessel and maritime applications: 500 kW – multi MW

HPM-250



HIGH POWER SYSTEM



Compatibility with Future E-Fuels

Modularity enables compatibility with liquid e-fuels for future retrofits or new vessels

HYDROGEN VESSELS



FUELS

- Compressed hydrogen
- Liquid hydrogen

E-FUELS WITH REFORMATION



FUELS

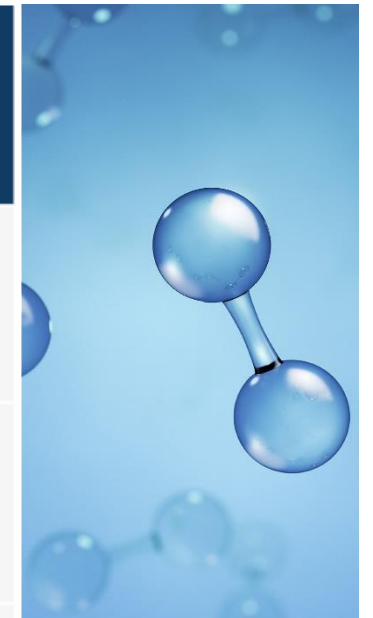
- Methanol
- Liquid hydrogen
- LOHC
- Ammonia

Technology Comparison

A scalable cost-effective zero-emissions solution for marine

Comparison of different powertrain technologies, based on a 30 kW marine propulsion system with a 12 hour range.

| | LIFETIME (YRS.) | EFFICIENCY | REFUELLING TIME | WEIGHT (GENERATOR + FUEL) | EQUIPMENT COST | COST OF OWNERSHIP (5 YRS.) | TOTAL VOLUME |
|----------|-----------------|------------|-----------------|---------------------------|-------------------------|----------------------------|--------------|
| HYDROGEN | 15 - 20 | ■ ■ | 15 mins | ■ | ■ ■ ■ ■ | ■ ■ | ■ ■ ■ |
| BATTERY | 5 - 10 | ■ ■ ■ ■ | 5 - 10 hrs | ■ ■ ■ ■ ■ ■ | ■ ■ ■ ■ ■ ■ ■ ■ ■ | ■ ■ ■ | ■ ■ ■ ■ |
| DIESEL | 15 - 20 | ■ | 15 mins | ■ | ■ | ■ ■ | ■ |

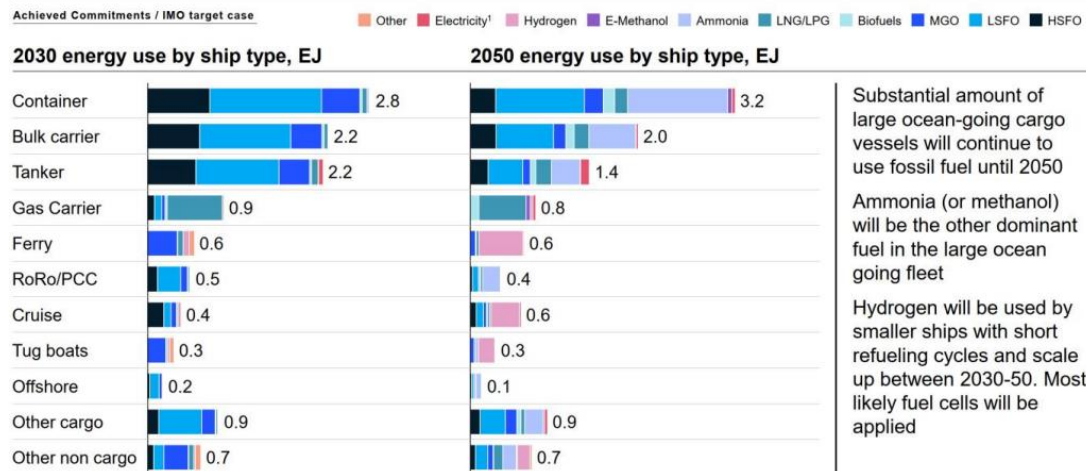


The Genevos HPM is 1/3 of the weight of a typical diesel generator

Hydrogen – A Vital Future Fuel for Marine

Incentivising global H2 infrastructure to access clean hydrogen

Detailed forecasts indicate that hydrogen will play a crucial role in decarbonising ferries, service vessels and cruise ships.



1. Includes both shore power (cold ironing) and battery electric vessels (BEVs)

Source: McKinsey Energy Insights analysis powered by Maersk Mc-Kinney Møller Center for Zero Carbon Shipping NavigaTE model



COMMERCIAL OPPORTUNITY

- Payback after 6 years with over 20% of savings after 10 years in operation relative to diesel system, based on TCO
- Cost of equipment is 50% less than all-lithium battery system for 24 hr system range
- Cost of green hydrogen forecast to halve before 2030 and will undercut all other forms of hydrogen and hydrogen e-fuels

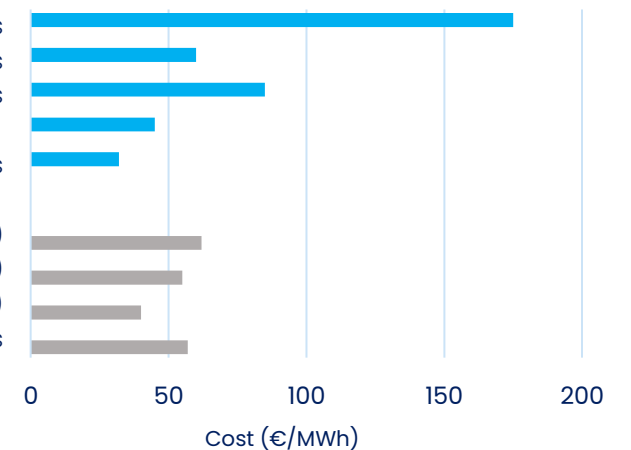
Projected fuel costs – 2030 ^

RENEWABLE FUELS

- Battery Storage of renewables
- Ammonia from renewables
- Methanol from renewables
- Gas oil from Biomass
- Hydrogen from renewables

FOSSIL FUELS

- Marine diesel oil (MDO)
- Low sulphur heavy fuel oil (LSHFO)
- Liquified natural gas (LNG)
- Hydrogen from natural gas



^ Source: Zero-Emission Vessels - Transition Pathways 2019

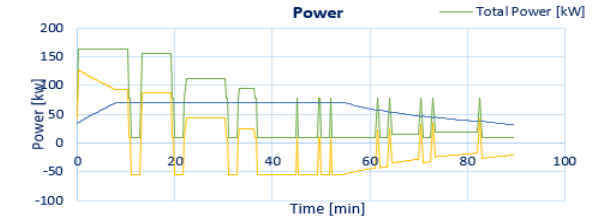
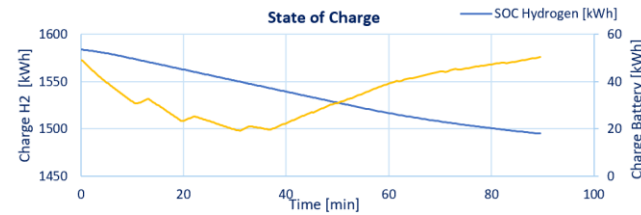
Engineering for Efficiency



System sizing, installation design, power management

Genevos offers engineering services for clients exploring and applying HPM solutions through the provision of in-house simulation tools and expertise in management of power, control, and hydrogen gas.

Further supporting on installation and commissioning, Genevos additionally provides support services for efficiency and performance optimisation, along with an annual service package.



SERVICES

Offsite

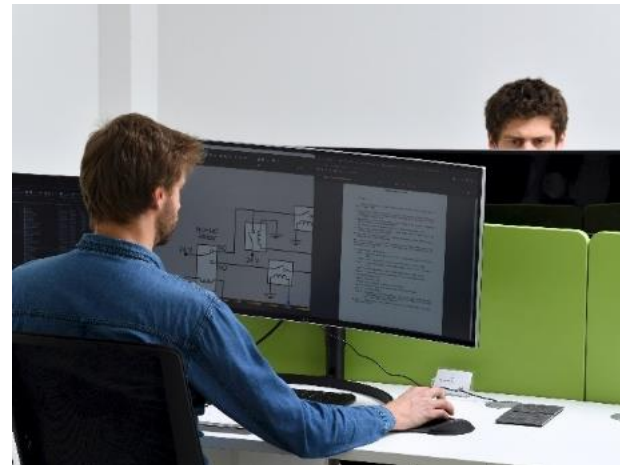
- Preliminary sizing studies based on vessel operational profile
- Hydrogen system integration design
- Safety & risk assessment

Onsite

- Commissioning support
- System installation

After-Sales

- Cloud connectivity & remote monitoring
- Power Management System (PMS) upgrades and performance optimisation
- Annual Service Package



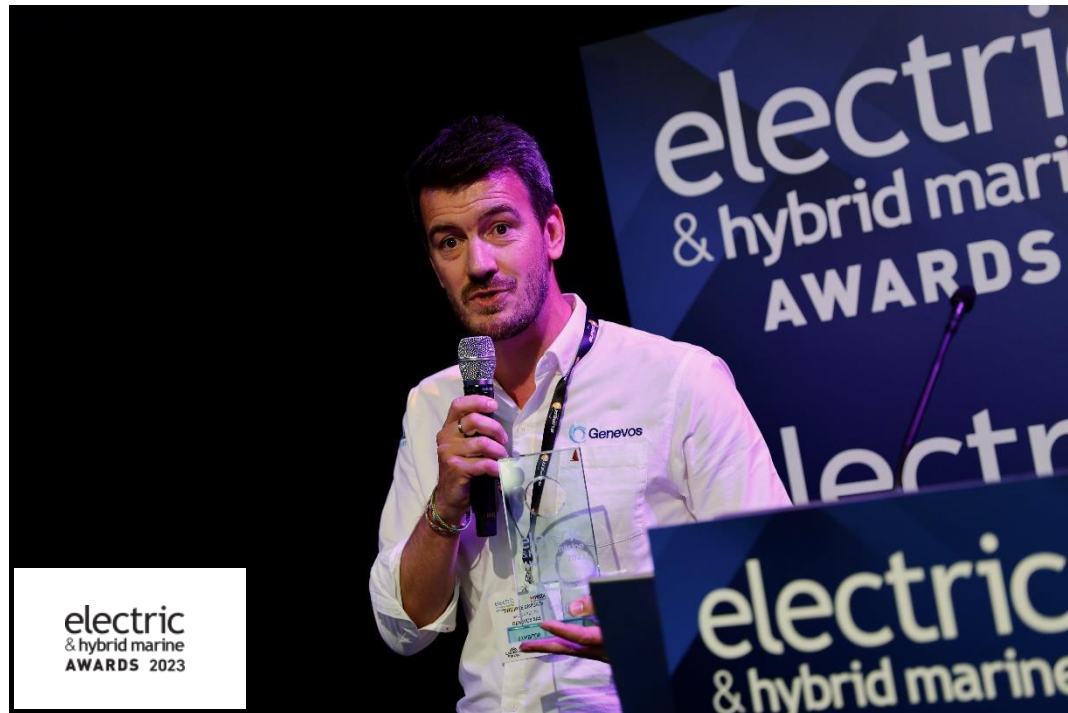
Recent Awards

Accelerating the clean hydrogen transition

Genevos' award-winning and drop-in marine fuel cell revolutionises maritime power by offering an environmentally friendly solution with high scalability and redundancy.



Hydrogen Breakthrough of the Year Award



Monaco Prize for Innovation in Hydrogen & Transportation



Partners & Associations

Collaborating for the clean transition



CERTIFICATION



PROJECT



R&D PARTNERS



NETWORKS



AWARDS



Contact Us

Find out more about how to decarbonise your vessel or fleet



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Innovating zero emission power solutions to enable clean and resilient mobility on our oceans

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