



Sustainable HYdrogen
powered Shipping

SHYPS & PROJECT CONSORTIUM PRESENTATION

The shipping industry is facing one of the most demanding challenges ever: to find the way to achieve zero-emission navigation. The time to achieve such goal is very short: the next big deadline imposed by the IMO is to reduce the total annual GHG emissions from international shipping by at least 50% by 2050.

Hydrogen is one of few zero-emission solutions that is very promising, but the technology necessary to use it on board is not completely ready. To combine the tight application times and the technological gap, sHYpS is centered around the idea of a swappable storage system for the liquid hydrogen, based on new c-type ISO containers. This solution can enable a full zero emission ship platform in the needed time.

sustainable HYdrogen powered Shipping Research and Innovation Action

Acting towards a cornerstone in the Decarbonisation of the Maritime Industry

sHYpS aims at supporting the decarbonisation of the shipping industry, by developing a novel LH2 swappable storage solution, which can be adapted to multiple types of vessels and speed up the green transitioning. sHYps project trigger the hydrogen supply-chain development, generating demand, while tackling safety and handling requirements.

The supply chain of Hydrogen is in its very first stage of development and containers are still the only fast-track feasible logistic solution, so far. Moreover, only a few companies produce c-type insulated tanks that are used for the transport of hydrogen. The sHYpS concept aims to upgrade the containers technology to enable to use them as fuel tank, which also requires adding a connection space to transform the stored liquid hydrogen into gas.

More in detail, sHYpS will develop:

- A novel hydrogen swappable intermodal storage 40' ISO c-type container, that can be loaded and unloaded by on-board facilities.
- The blueprint of a dedicated logistic network, based on swapping pre-filled containers, for the delivery of green liquid hydrogen to vessels.
- The complete detailed design of modular containerized powertrain based on optimized PEM Fuel Cells.

The project contributes to the green transition of the marine industry, by sparking the hydrogen supply-chain development, generating demand, while tackling safety and handling requirements. On one hand the project will set up a logistic based on swapping pre-filled containers, on the other hand it will define a perspective scale-up of the storage capacity and the supply, applied to the Port of Bergen use-case. This will allow to kick start a supply-chain without waiting for the full infrastructure to be in place.

sHYpS will contribute to:

- Develop a preliminary design of a fully renewable ship by 2027 (passengers and freight), leaving no residual challenges to an up-scaled solution,
- Realise a shorter-term hybrid solution implemented within Viking's next new building program to be delivered by 2025 and which is scalable to comply with IMO 2030 and eventually IMO 2050 (50% emissions cut), with a fast-track market potential.
- Demonstrate that the IMO roadmap is realistic and achievable using state of the art technologies.
- Develop an intermodal LH2 container and a zero-emission megawatt generator product line, to be used in several transport and stationary industries, by 2024/2025.



sHYpS Consortium

13 Partners, one goal

The project assembles leading entities all over Europe, covering all relevant competences needed to achieve the ambitious goal of the project.



NAVALPROGETTI SRL

www.navalprogetti.com

NAVALPROGETTI S.r.l., is a Ship Design Company of Naval Architects, Marine and Industrial Engineers and Ship Surveyors that has been operating since 1975. Navalprogetti is specialized in consulting, design and engineering: from small concept developments to complete engineering packages in the marine and offshore sectors. We offer services to the Marine and Offshore industries worldwide. Navalprogetti key skills cover, among others: structural and hydrodynamic calculations, seakeeping, mooring and DP analysis, inclining experiments and ship surveys, on-site measurements for vessels operating in iced waters, structural optimization, etc.

ROLE IN THE PROJECT:

Navalprogetti acts as the project coordinator in WP9 and leads the fuel handling and integration design in WP2 and WP6. It also participates to WP1 and has a prominent role in the definition of concept design for the freight segment in WP7.

VIKING HYDROGEN AS

www.viking.com



Viking was founded in 1997 with the vision that travel could be more destination focused and culturally immersive. The Viking Group operates over 80 small cruise ships worldwide and cater to roughly 520'000 unique guests (2019) annually. Viking Hydrogen (NO) is its fully owned subsidiary and was specifically established in 2019 to support the Viking Group in the development and implementation of new zero-emission technology solutions for maritime use and application in the Group's fleet of ocean, river and ocean vessels. As such, the company has an established mission and a business-oriented approach that will ensure commitment and connection to the Group's board and decision making in the Viking Group, ensuring replicability.

ROLE IN THE PROJECT:

Viking will be the main and first adopter of the project results and will also supervise the integration on board its cruise fleet. In parallel, the company will manage the investment decision to also deliver a 6MW powertrain on its ships.

CHART, here acting via its Italian branch, VRV and the Czech affiliated Chart Ferox, is a leading manufacturer of highly engineered equipment for multiple markets in energy and industrial gas liquefaction, storage & distribution equipment and systems for LNG, hydrogen and other industrial gases such as helium. In sHYpS, it has been identified as the EPC partner for the design and construction of the LH2 ISO container and gas vaporization system. In US, CHART has worked with Liquid Hydrogen since the late 1960's, supplying 90-95% of North American LH2 storage: they have also carried out the site installation, storage and piping of LH2 for the Rocket Launching Platform.

ROLE IN THE PROJECT:

CHART is leader of WP1 and is responsible for developing of LH2 ISO storage containment.

CENERGY SRL www.cenergy.it



CENERGY is a spin-off from the University of Trieste founded in 2010.

They have been involved in the design and development of low environmental impact energy production systems based on hydrogen-powered fuel cells since its early years. CENERGY is located within one of the campuses of AREA Science Park, the oldest science and technology park in Italy hosting: (i) highly specialized research and training centres, (ii) research and development and service centres of external companies, (iii) start-ups, (iv) the synchrotron light laboratory ELETTRA. CENERGY operates in the area of advanced technologies for energy conversion, energy recovery, and energy storage, with a focus on Fuel Cells, integration of Fuel Cells into custom-specific designs of power systems, and with a focus on storage and transport of CNG and hydrogen.

ROLE IN THE PROJECT:

CENERGY's main contribution relates to the identification of optimal system design and optimal operating control strategies in WP3 and WP5, to reduce emissions and operation costs and maximise energy efficiency and reliability.





**UNIVERSITÀ
DEGLI STUDI
DI TRIESTE**

UNIVERSITÀ DEGLI STUDI DI TRIESTE

www.units.it

Description: The UNIVERSITÀ DEGLI STUDI DI TRIESTE is a public research university in Trieste, in the Friuli-Venezia Giulia region in northeast Italy. The university consists of 10 departments, boasts a wide and almost complete range of university courses and has about 15,000 students and 1,000 professors. It was founded in 1924. In sHYpS, the engineering department will be mainly involved in performing Exergy analysis and numerical simulation modelling of the ship energy systems to assist in the preliminary phase of the components and plant choice and design.

ROLE IN THE PROJECT:

UNIVERSITÀ DEGLI STUDI DI TRIESTE contributes to testing of LH2 ISO storage and the overall ship energy analysis. They will also be the Data Stuart of the project, responsible for managing the Open Science for sHYpS.

HYPULSION SAS

www.plugpower.com



HYPULSION was born as a European Joint Venture of Plug Power, leader in hydrogen in North America and was fully acquired in 2015 to develop Plug Power's business in Europe. Since its founding in 1997, Plug Power has led the Hydrogen Revolution, bringing the advantages of the total, end-to-end green hydrogen ecosystem — from production, storage and delivery to energy generation — to customers around the world.

ROLE IN THE PROJECT:

HYPULSION is the leader of WP4 and is responsible for developing logistics solution and handling design.



JEUMONT ELECTRIC SAS

www.jeumontelectric.com/en

Jeumont Electric is a high-tech company specialized in high-power electric machines and auxiliary equipment. The company effectively leverage its strengths to respond to three major challenges: - growing worldwide energy demand. - the need for more efficient, environmentally friendly electrical solutions. - more economical use of energy and, in particular, using variable speed drives to boost energy efficiency.

ROLE IN THE PROJECT:

JEUMONT ELECTRIC SAS is the leader of WP5 and is responsible for designing the overall electrical system of the power plant of ships.

BERGEN HAVN AS

bergenhavn.no/en/port-of-bergen-the-most-important-maritime-hub-in-western-norway



The Port of Bergen has for many hundred years been one of Norway's most important cities for trade, fishing, petroleum activities, ship technology, cruise tourism and aquaculture. Today, Bergen is Norway's second largest port, and it is one of the most popular cruise destinations in Northern Europe. Its key areas of focus are to promote sea transport and to manage, operate, and develop the port facilities. Port of Bergen is committed to the development of innovative and sustainable solutions for an eco-friendlier port. The company has 48 employees, and its offices can be found at the Jekteviken Terminal in Bergen.

ROLE IN THE PROJECT:

BERGEN HAVN AS contributes to logistics development in terms of ports requirements and ensures safe bunkering systems.



KONTOR17 MPM GMBH

www.kontor17-ship.com

Kontor 17 MPM GmbH is a first-class provider with full flexible service for our customers. The company supplies our customers with tailor made solutions for their required needs in ship management and ship operations. K17 covers the full scope of services of technical and operational ship management, quality management, insurance handling, crewing, controlling and reporting. All vessels are operated in compliance with local, national and international rules and regulations. K17 is certified for the operation of seagoing ships and the vessels are operated with a main focus on cost control and minimization of technical and operational downtime. The managed vessels are chartered-out to major charterers, such as Maersk, MSC, CMA CGM, Wanhai Lines, Evergreen, OOCL and others. In addition to the ship management activities, K17 is also active in the fields of project development and financing for the non-operating owners as well as of newbuilding developments, especially in regard to green shipping. With an excellent network to shipyards, class societies, suppliers and insurers. Research and advisory for banks, investors and non-operating owners is handled by the affiliated company K17 Consulting.

ROLE IN THE PROJECT:

KONTOR17 MPM GMBH is the leader of WP7, being the primary business developer to bring the concept design for commercial vessels to the market and contributes to upscaling of sHYpS' solution.

CIAOTECH – PNO GROUP

www.pnoconsultants.com/it



The PNO Group (aka PNO Consultants), established in 1984, is a European group, made up of a pool of more than 400 professionals across 8 Member States. Every year, PNO supports more than 3.000 clients in their R&D processes, realizing original data-driven and expert-driven analysis and creating over 300 cutting-edge R&D projects – changing the world for the better. PNO has drafted and successfully executed dissemination and exploitation plans of a great number of European projects in various sectors. In this project, PNO is represented by CIAOTECH S.r.l., the Italian branch of PNO Consultants, specialized in R&D Advisory, Innovation Management and funding procurement, providing consultancy services to private and public organizations.

ROLE IN THE PROJECT:

CIAOTECH will support the coordinator for professional project management and it is the work package leader of WP8, Dissemination, Communication and Exploitation, to support market studies and the business replication potential of the project, by adopting its own IT tools and methodologies. CIAOTECH will be supported by other entities from the PNO Group: Innovation Engineering Srl (providing IT tools for the project innovation management) and NEHEM BV (supporting the Gender Equality analysis during the project).



RICARDO PLC

www.ricardo.com

Ricardo plc is a global strategic engineering consulting company, listed on the London Stock Exchange. With over 100 years of engineering excellence and employing close to 3,000 employees in more than 20 countries, Ricardo provides exceptional levels of expertise in delivering innovative cross-sector sustainable outcomes to support energy transition and scarce resources, environmental services together with safe and smart mobility.

ROLE IN THE PROJECT:

Leader of WP3, RICARDO is responsible for fuel cell integrated design and overall energy management of LH2 ISO storage containment. Ricardo participates in the sHYpS project with its two entities RICARDO PRAGUE S.R.O. and RICARDO CONSULTING ENGINEERS LIMITED.





Lloyd's Register EMEA IPS (LR) is a global independent risk management and safety assurance organization that works to enhance safety and to approve assets and systems at sea, on land and in the air. Lloyd's Register EMEA IPS, its subsidiaries and affiliates provide services designed to help clients around the world to achieve their business goals, while optimizing safety and quality, and protecting, even improving, the environment. Within LR the Marine Business participates in technical meetings of the International Association of classification Societies (IACS), currently holding the Association's chairmanship, contributes to the development of codes for bodies such as the Internal Maritime Organisation (IMO), and helps with the review of ISO (International Organisation for Standardisation) standards. LR also acts as a 'notified body' for many European Community directives, helping ensure essential product safety rules work properly.

ROLE IN THE PROJECT:

LLOYD'S REGISTER EMEA IPS contributes to the design and testing of LH2 ISO storage containment. In addition, it is also involved in the fuel gas handling system design review, and overall electrical integration with the ship.

Project Kick-Off

On June 1st, 2022, sHYpS kicked off! The partners met on June 29th and 30th in Brussels (Belgium) to discuss the work plan for the next 4 years and the main activities that will be carried out in the frame of the project.



Visit sHYpS [website](#) to learn more about this EU initiative and follow the project on [LinkedIn](#) and [Twitter](#) to be always updated on the latest news!

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www.shyps.eu



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